

Garments design and pattern making

THIRD SEMESTER										
Sl. No	Subject code	Name of the subject	T P C			Marks				
						Theory		Practical		Total
						Cont. assess.	Final exam.	Cont. assess.	Final exam.	
1	1921	Textile Raw Materials-II	2	0	2	20	80	-		100
2	4931	Yarn Manufacturing	3	3	4	30	120	25	25	200
3	6811	Basic Electronics	2	3	3	20	80	25	25	150
4	5931	Mathematics – III	3	3	4	30	120	50	-	200
5	5922	Physics – II	3	3	4	30	120	25	25	200
6	6621	Computer Application– I	0	6	2	-	-	50	50	100
7	5811	Social Science-I	2	0	2	20	80	-	-	100
		TOTAL	15	18	21	150	600	175	100	1050

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. |

AIMS

To provide the students with an opportunity to develop knowledge, skill and attitude in the area of yarn manufacturing with special emphasis on:

- Aspects of spinning.
- Blow room and carding.
- Combing and speed frame.
- Ring frame and long stable fiber.

SHORT DESCRIPTION

Aspects of spinning, Blow room, Opening and cleaning of blow room, Carding machine, Draw frame, Combing machine, Simplex, Ring frame, Long stable fiber; Jute draw frame, Jute spinning frame.

DETAIL DESCRIPTION

Theory

1. Understand the basic aspects of spinning.

- 1.1 Define spinning.
- 1.2 Mention the classification of spinning system.
- 1.3 Describe the chronological development of cotton spinning systems.
- 1.4 Mention the main characteristics of spinning fibers.
- 1.5 Describe the flow chart of cotton spinning system.

2. Understand the blow room.

- 2.1 Mention the meaning of blow room.
- 2.2 Describe the objectives of blow room.
- 2.3 Describe the functions of blow room.
- 2.4 Describe the typical sequences of blow room.
- 2.5 Describe blow room actions.

3. Understand opening and cleaning of blow room.

State the principle of opening & cleaning of blow room.

Describe the bale plucker.

Describe bale breaker & ultra cleaner.

Describe the procupine opener with condenser and krishner beater.

Describe bladed beater & de-dusting element.

Describe chute feed to card.

Mention advantages & disadvantages of chute feed to card.

Mention the speed of blow room machineries.

Find the cleaning efficiency and production of blow room machineries.

4. Understand the carding machine.

Define carding.

Mention the importance of carding.

Mention different types of card.

Describe the working principle of carding.

Describe carding & stripping action.

Describe card sets.

Describe the stripping of carding process.

Describe extraction and control process of waste and dust.

Describe can setting, speeds, production, settings and cleaning efficiency.
Find the speed and production of card machine.
Describe fault of card sliver with its remedy.

5. Understand the draw frame.

Define drafting.
Mention the objectives of drawing.
Describe different drafting systems.
Describe the effects of doubling and drafting of draw frame.
Describe draw frame, coiler setting & auto levelers.

6. Understand the combing machine.

Mention the objectives of drawing.
Describe the methods of minilap preparation.
Describe combing cycle.
Describe combing waste and waste control.
Describe drafting systems & main setting of comber.
Describe the methods of waste removal.

7. Understand the simplex (Speed frame).

Mention the objectives of simplex.
Describe different types of drafting system of simplex.
Describe the winding process of simplex.
Describe the driving motion of simplex.
Define building motion.
Describe building mechanism of simplex.
Find the speed and production of simplex.

8. Understand the ring frame.

Mention the objectives of ring frame.
Mention the function of ring frame.
Describe the drafting system of the ring frame.
Describe the setting of ring frame.
Find the speed and production of ring frame.
Describe the spindle of ring frame.
Describe the travelers of the ring frame.

9. Understand the long staple fiber (jute).

Describe flow charts for the production of long staple fiber.
Describe batching method of the long staple fiber.
Describe the softening of jute.
Distinguish softening and spreading process of jute.
Mention the importance of batch selection.
Define jute carding.
Mention the classification of jute carding.
Define jute carding process.

10. Understand the jute draw frame.

Define jute draw frame.
Mention the objectives of jute draw frame.

Mention the classification of jute draw frame.
Describe different drafting systems of jute draw frame.
Describe the process of jute draw frame.
Find the speed and production of jute draw frame.

11. Understand the jute spinning frame.

Mention the objectives of jute spinning frame.
Describe the function of jute spinning frame.
Describe the drafting system of jute spinning frame.
Find the speed and production of jute spinning frame.

PRACTICAL

1. Determine the figure of bale plucker & bale opener.
2. Determine the raw material path through the bale opener.
3. Draw the figure of ultra cleaner.
4. Determine the speed of beaters to grid bar setting.
5. Determine the speed of procopine beater.
6. Determine the draft of blow room.
7. Determine the production rate of blow room.
8. Determine the fiber and sliver path through the carding machine.
9. Draw the figure of carding machine.
10. Determine draft speed and production of carding machine.
11. Draw the fiber path of simplex.
12. Find the draft & production of simplex machine.
13. Draw gearing diagram of simplex machine.
14. Draw gearing diagram of ring frame.
15. Calculate draft; draft constant and production of the ring frame.
16. Determine the speed of spindle.
17. Draw the fiber path through the softener & spreader machine.
18. Calculate the oil % of emulsion application.
19. Draw the gearing of breaker card.
20. Draw the gearing of finished card.
21. At least to running spinning mills visit.

REFERENCE BOOKS

1. Manual of cotton Spinning Volume-II, Byerley and Buckley
2. Manual of cotton Spinning Volume-III, Byerley and Buckley
3. Cotton Spinning, Willian Taggart.
4. Spun Yarn Technology Vol-1, A Venkata Subraman.
5. Jute Fiber to Yarn, RR Atkinson.
6. Hand Book of jute, T.C. Ranjan.
7. Jute Spinning, H. AHMED.
8. ইয়ার্প ম্যানুফ্যাকচারিং-১, মোঃ মহিবুল ইসলাম

OBJECTIVES

- To provide understanding soldering technique and color code.
- To provide understanding and skill on the basic concept of semiconductor and to identify physically a range of semiconductor diodes.
- To develop comprehensive knowledge and skill on special diodes and devices.
- To develop the abilities to construct different rectifier circuits.
- To provide understanding of the basic concept and principle of transistor and to identify physically a range of transistor.
- To provide understanding and skill on the basic concept of logic gates.
- To provide the understanding skill on using Electronic measuring and testing equipment.

SHORT DESCRIPTION

Color code and soldering; Semiconductor; P-N junction diode; Special diodes and devices; Power supply; Transistor; Transistor amplifier; Logic gates Electronic measuring and test equipment.

DETAIL DESCRIPTION

Theory:

1 Understand the Concept of soldering and Color Code.

- 1.1 Define soldering.
- 1.2 Describe the different types of solder.
- 1.3 List the things needed in soldering.
- 1.4 Mention the properties of a good soldered joint.
- 1.5 Describe the functions and construction of (i) Single sided, (ii). Double sided & (III) Multi layered Printed circuit board.
- 1.6 Mention the function of resistor, capacitor and inductor in electronic circuits.
- 1.7 Describe the procedure of determining the value of Capacitor, & Resistor using numeric and color code.

2 Understand the Concept of Semiconductor.

- 2.1 Define Conductor, Semiconductor and Insulator.
- 2.2 Describe Semiconductor with atomic structure.
- 2.3 Describe the effect of temperature on conductivity of Semiconductor.
- 2.4 Explain the energy band diagram of Conductor, Semiconductor and Insulator.
- 2.5 Classify Semiconductor.
- 2.6 Describe the generation & recombination of hole and electron in Intrinsic Semiconductor.
- 2.7 Define doping, P-type & N-Type material, covalent bond, majority & minority charge carrier.
- 2.8 Explain the characteristics of Carbon, Gallium Arsenide/Phosphide.

3 Understand the Concept of P-N Junction Diode

- 3.1 Define PN junction diode
- 3.2 Describe the formation of depletion layer in PN junction.
- 3.3 Discuss potential barrier, drift & diffusion current and their physical significance.
- 3.4 Mention the behavior of PN junction under forward and reverse bias.
- 3.5 Explain the forward & reverse current voltage (IV) characteristics of PN junction diode.

- 3.6 Explain the effect of temperature Si & Ge diode characteristics
- 3.7 Define (i) static resistance (II) Dynamic resistance, (III forward breakdown voltage and (II) Reverse break down voltage.
- 3.8 Draw the equivalent circuit of PN junction diode.
- 3.9 Describe the specification of diode.

4 Understand the DC power supplies.

- 4.1 Define dc power supply.
- 4.2 Mention the importance of dc power supply.
- 4.3 Define rectification and rectifier.
- 4.4 Explain the operation of Half wave, Full wave and Bridge rectifier.
- 4.5 Discuss ripple factor & efficiency and TUF of Half wave, Full wave and Bridge rectifier.
- 4.6 Explain the operation of different types filter circuits with wave shape.
- 4.7 Define regulated and unregulated power supply.
- 4.8 Describe the block diagram of a typical regulated dc power supply.

5 Understand the Concepts of Special diode.

- 5.1 Define Zener break down.
- 5.2 Describe the operation of Zener diode.
- 5.3 Explain IV characteristics of Zener diode.
- 5.4 Describe the application of Zener diode in (i) voltage stabilization, (ii) meter protection and (II) peck clipper circuits.
- 5.5 Describe the construction operation and application of (I) Tunnel diode (II) varactor diode (III) Schottky diode (iv) Step-Recovery diode (v) PIN diode, (vi) LED (vii) LCD (viii) photo diode (ix) Solar cell.
- 5.6 Describe the construction operation and application of (i) DIAC (ii) TRIAC and (iii) SCR.

6 Understand the construction and operation of Bipolar Junction Transistor (BJT)

- 6.1 Define Transistor.
- 6.2 Describe the construction PNP and NPN Transistor.
- 6.3 State the biasing rules of BJT.
- 6.4 Explain the mechanism of current flow of PNP and NPN Transistor.
- 6.5 Establish the relation among Base, Emitter and Collector current ($I_E = I_C + I_B$)
- 6.6 Draw the three basic transistor configuration circuits (CB, CC, CE).
- 6.7 Describe current amplification factor α , β and γ .
- 6.8 Establish the relation among α , β and γ .
- 6.9 Solve problem related to I_E , I_C , I_B , α , β and γ .

7 Understand the concept of BJT Amplifier

- 7.1 Define (i) Amplifier (ii) Amplification and (III) Gain
- 7.2 Mention the classification of Amplifier.
- 7.3 Describe the principle of operation of a common emitter (CE) Amplifier.
- 7.4 Draw DC & AC equivalent circuits of the CE amplifier circuit.
- 7.5 Mention the formula of (i) input resistance (ii) Output Resistance (iii) Current gain (iv) Voltage gain and (v) power gain.
- 7.6 Solve problem related to different gain resistance.

8 Understand the main feature of digital electronics

- 8.1 Describe the difference between analog and digital signal.
- 8.2 State the advantage of digital system.

- 8.3 Define logic gate.
- 8.4 Describe the basic operation of logic gates and, or, not n and, n or, x or & xn or.
- 8.5 Prepare truth table of logic gates and, or, not n and, n or, x or & xn or.

9 Understand the Electronic measuring and testing equipment

- 9.1 Define AVO meter.
- 9.2 Describe the procedure of measuring current, voltage and resistance using AVO meter.
- 9.3 List the control knobs of Oscilloscope.
- 9.4 Explain the procedure of measuring frequency and voltage using Oscilloscope.
- 9.5 Mention the function of (i) Function Generator (ii) Logic Probe (iii) Semiconductor Tester.

PRACTICAL:

1 Show skill in identifying the electronic components.

- Observe the electronic components board and read the manuals.
- Identify the different types of resistors with their values, tolerance and wattage.
- Identify the different types of potentiometers with their values, & wattage.
- Identify the different types of capacitors with their values, dc working voltages and types.
- Identify the different types of diodes & rectifiers with the numbers and specifications.
- Identify the different types of transistors and thyristors with their number and specifications.
- Identify the different types of LED's, IC's and miniature relays with their number & specification.
- Identify different types of transformer with their specification.
- Identify different inductors with their values & current ratings.
- Study the printed circuit boards.
- Sketch the symbols of components used in electronic circuits.
- Describe the basic function of each component.
- Write a report on above activities.

2 Show skill in electrical measurement.

- Perform simple voltage and current measurements on basic series and parallel resistor circuits using the following instruments.

 - a) Voltmeters and ammeters
 - b) AVO meters
 - c) Digital multimeter
 - d) Basic CRO

3 Show skill for determining the values of different resistors and capacitors with the help of color code.

- Select color code resistors & capacitors of different values.
- Identify the colors and their numerical numbers.
- Determine the value of resistors with tolerance.
- Determine the value of capacitors and dc working voltage.
- Write a report on above activities.

4 Show skill in performing soldering.

- Select wires (single strand and multi strand) and cut wires to required length.
- Select soldering iron, soldering tag and soldering lead.
- Remove wire insulation to required length.
- Clean and tin both iron and work piece.

Use a tinned iron in order to transfer adequate heat to the joint.
Joint two singles stranded wires mechanically and solder.
Joint two multi-strand wires mechanically and solder.
Perform soldering exercise for making three dimensional wire frames.
Sketch and write a report on the job.

5 Show skill in soldering & desoldering of electronic components and wires to the other components and circuit boards.

Select electronic components, wires and PCB.
Determine the rating of the soldering iron suitable for the work piece.
Clean and tin both iron & work piece.
Feed new soldering materials to the tinned and heated joint, in order to produce a correctly soldering.
Check the quality of soldering.
Clean and tin iron and de-solder the joint and components.
Use solder suckers and solder braid for de-soldering.
Write a report on the Job.

6 Show skill in checking the semi-conductor diode.

Collect a range of semi-conductor diodes and manufactures literature.
Select the digital multimeter and set the selector switch to ohm range.
Determine the specification of semi-conductor diode.
Compare the determined specification with that of manufactures literature.
Measure forward & reverse resistances of the diode.
Identify p and p side of the diode.
Determine the condition of the diode.

7 Show skill in sketching forward and reverse characteristics curves of a semiconductor diode.

Select meter, power supply, components and materials.
Complete circuit according to circuit diagram for forward bias.
Check all connections.
Measure forward bias and corresponding forward current.
Record results in tabular form.
Connect circuit according to circuit diagram of reverse bias.
Measure reverse bias and corresponding reverse current.
Record results in tabular form.
Sketch the curves from data.

8 Show skill in sketching waves of half wave rectifier circuit.

Select meter, component, oscilloscope and materials.
Complete circuit of a half wave rectifier according to circuit diagram.
Check the circuit before operation.
Measure the input and output voltage and observe wave shapes in the oscilloscope.
Sketch the output voltage wave shape.

9 Show skill in sketching waves of full wave center tapped rectifier circuit.

Select meter, component, oscilloscope and materials.
Complete a full wave rectifier circuit according to circuit diagram.
Check the circuit supply & polarity of supply.
Measure the input & output voltages and observe wave shapes in the oscilloscope.

Sketch the output voltage wave shape.
Compare the result with half-wave rectifier circuit.

10 Show skill in constructing full wave bridge rectifier.

Select meter, component, oscilloscope and materials.
Build the circuit according to the circuit diagram.
Check the circuit.
Measure the input and output voltage.
Observe wave shape.
Compare the result with other rectifiers.

11 Show skill in identifying the bipolar junction transistor.

Select pnp & npn bipolar junction transistors.
Take DMM and manufacture's literature of transistor.
Identify transistor legs.
Measure base-emitter, base-collector, forward and reverse resistance.
Determine the specifications with help of manufacturer's literatures.
Identify pnp & npn transistor.

12 Show skill in determining input and output characteristics of a transistor in common emitter connection.

Select component, AVO meters, circuit board and required materials.
Construct the circuit.
Adjust the biasing voltage to appropriate point.
Record input and output voltage and current.
Plot the curve with recorded data.

13 Show skill in testing special diodes.

Select different types of special diodes.
Set the AVO meter in the ohm scale.
Measure resistances for each of two terminals.
Determine the condition (good and bad).
Determine the different terminals.

14 Verify the truth tables of different types of logic gates.

Select the specific gate.
Prepare the experimental circuit.
Adjust the power supply.
Verify the truth table.

REFERENCE BOOKS :

- | | | |
|--|---|------------------|
| 1. A Text Book of Applied Electronics | - | R.S. SEDHA |
| 2. Principles of Electronics | - | V. K. Mehta |
| 3. Basic Electronics (Solid Stater) | - | B. L. Theraja |
| 4. Electronic Devices and Circuit Theory | - | ROBERT BOYLESTAD |
| | - | LOUIS NASHELSKY |

5931

MATHEMATICS – III

T P C

3 3 4

AIMS

- To make understand the basic concept and techniques of composition and resolution of vectors and computing the resultant of vectors.

- To enable to use the knowledge of gradient of a straight line in finding speed, acceleration etc.
- To enable to use the knowledge of conic in finding the girder of a railway bridge, cable of a suspension bridge and maximum height of an arch.
- To provide ability to apply the knowledge of differential calculus in solving problem like slope, gradient of a curve, velocity, acceleration, rate of flow of liquid etc.
- To enable to apply the process of integration in solving practical problems like calculation of area of a regular figure in two dimensions and volume of regular solids of different shapes.

SHORT DESCRIPTION

Vector	: Addition and subtraction, dot and cross product.
Co-ordinate Geometry	: Co-ordinates of a point, locus and its equation, straight lines, circles and conic.
Differential Calculus	: Function and limit of a function, differentiation with the help of limit, differentiation of functions, geometrical interpretation of $\frac{dy}{dx}$, successive differentiation and Leibnitz theorem, partial differentiation.
Integral Calculus	: Fundamental integrals, integration by substitutions, integration by parts, integration by partial fraction, definite integrals.

DETAIL DESCRIPTION

Vector

- 1 Apply the theorems of vector algebra.**
 - 1.1 Define scalar and vector.
 - 1.2 Explain null vector, free vector, like vector, equal vector, collinear vector, unit vector, position vector, addition and subtraction of vectors, linear combination, direction cosines and direction ratios, dependent and independent vectors, scalar fields and vector field.
 - 1.3 Prove the laws of vector algebra.
 - 1.4 Resolve a vector in space along three mutually perpendicular directions
 - 1.5 solve problems involving addition and subtraction of vectors.
- 2 Apply the concept of dot product and cross product of vectors.**
 - 2.1 Define dot product and cross product of vectors.
 - 2.2 Interpret dot product and cross product of vector geometrically.
 - 2.3 Deduce the condition of parallelism and perpendicularity of two vectors.
 - 2.4 Prove the distributive law of dot product and cross product of vector.
 - 2.5 Explain the scalar triple product and vector triple product.
 - 2.6 Solve problems involving dot product and cross product.

CO-ORDINATE GEOMETRY

- 3 Apply the concept of co-ordinates to find lengths and areas.**
 - 3.1 Explain the co-ordinates of a point.
 - 3.2 State different types of co-ordinates of a point.

- 3.3 Find the distance between two points (x_1, y_1) and (x_2, y_2) .
- 3.4 Find the co-ordinates of a point which divides the straight line joining two points in certain ratio.
- 3.5 Find the area of a triangle whose vertices are given.
- 3.6 Solve problems related to co-ordinates of points and distance formula.
- 4 Apply the concept of locus.**
- 4.1 Define locus of a point.
- 4.2 Find the locus of a point.
- 4.3 Solve problems for finding locus of a point under certain conditions.
- 5 Apply the equation of straight lines in calculating various parameter.**
- 5.1 Describe the equation $x=a$ and $y=b$ and slope of a straight line.
- 5.2 Find the slope of a straight line passing through two point (x_1, y_1) and (x_2, y_2) .
- 5.3 Find the equation of straight lines:
- Point slope form.
 - Slope intercept form.
 - Two points form.
 - Intercept form.
 - Perpendicular form.
- 5.4 Find the point of intersection of two given straight lines.
- 5.5 Find the angle between two given straight lines.
- 5.6 Find the condition of parallelism and perpendicularity of two given straight lines.
- 5.7 Find the distances of a point from a line.
- 6 Apply the equations of circle, tangent and normal in solving problems.**
- 6.1 Define circle, center and radius .
- 6.2 Find the equation of a circle in the form:
- $x^2 + y^2 = a^2$
 - $(x - h)^2 + (y - k)^2 = a^2$
 - $x^2 + y^2 + 2gx + 2fy + c = 0$
- 6.3 Find the equation of a circle described on the line joining (x_1, y_1) and (x_2, y_2) .
- 6.4 Define tangent and normal.
- 6.5 Find the condition that a straight line may touch a circle.
- 6.6 Find the equations of tangent and normal to a circle at any point.
- 6.7 Solve the problems related to equations of circle, tangent and normal.
- 7. Understand conic or conic sections.**
- 7.1 Define conic, focus, directrix and eccentricity.
- 7.2 Find the equations of parabola, ellipse and hyperbola.
- 7.3 Solve problems related to parabola, ellipse and hyperbola.

DIFFERENTIAL CALCULUS

FUNCTION AND LIMIT

8. Understand the concept of functions and limits.

Define constant, variable, function, domain, range and continuity of a function.

Define limit of a function

Distinguish between $f(x)$ and $f(a)$.

8.4 Establish i) $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$

ii) $\lim_{x \rightarrow 0} \frac{\tan x}{x} = 1.$

9. Understand differential co-efficient and differentiation.

Define differential co-efficient in the form of

$$\frac{dy}{dx} = \lim_{h \rightarrow 0} \frac{f(x+h)-f(x)}{h}$$

Find the differential co-efficient of algebraic and trigonometrical functions from first principle.

10. Apply the concept of differentiation.

State the formulae for differentiation:

- i) Sum or difference
- ii) Product
- iii) Quotient
- iv) Function of function
- v) Logarithmic function

Find the differential co-efficient using the sum or difference Formula, product formula and quotient formula.

Find the differential co-efficient function of function and logarithmic function.

11. Apply the concept of geometrical meaning of $\frac{dy}{dx}$

Interpret $\frac{dy}{dx}$ geometrically.

Explain $\frac{dy}{dx}$ under different conditions

Solve the problems of the type:

A circular plate of metal expands by heat so that its radius increases at the rate of 0.01 cm per second. At what rate is the area increasing when the radius is 700 cm ?

12 Use Leibnitz's theorem to solve the problems of successive differentiation.

Find 2nd, 3rd and 4th derivatives of a function and hence find n-th derivatives.

Express Leibnitz's theorem

Solve the problems of successive differentiation and Leibnitz's theorem.

13 Understand partial differentiation.

Define partial derivatives.
 State formula for total differential.
 State formulae for partial differentiation of implicit function and homogenous function.
 State Euler's theorem on homogeneous function.
 Solve the problems of partial derivatives.

INTEGRAL CALCULUS

14 Apply fundamental indefinite integrals in solving problems.

Explain the concept of integration and constant of integration.
 State fundamental and standard integrals.

Write down formulae for:

- i) Integration of algebraic sum.
- ii) Integration of the product of a constant and a function.

Integrate by method of substitution, integrate by parts and by partial fractions.

Solve problems of indefinite integration.

15 Apply the concept of definite integrals.

Explain definite integration.

Interpret geometrically the meaning of $\int_a^b f(x)dx$

Solve problems of the following types:

i) $\int_0^{\frac{\pi}{2}} \cos^2 x dx$ ii) $\int_0^1 \frac{(\sin^{-1} x)^2}{\sqrt{1-x^2}} dx$

P* =Practical continuous assessment

5922

PHYSICS–II

T P C

3 3 4

AIMS

- To provide a foundation in scientific principles and processes for the understanding and application of technology.

- To develop an understanding of fundamental scientific concepts through investigation and experimentation.
- To provide a common base for further studies in technology and science.
- To develop the basic knowledge of modern physics.

SHORT DESCRIPTION

Thermometry, Calorimetry, Expansion of materials (effect of heat), Heat transfer; Nature of heat and its mechanical equivalent; Engine. Principles of light and Photometry, Reflection of light, Refraction of light, lens. Concept of Electron and photon, structure of atom, Theory of Relativity.

DETAIL DESCRIPTION

Theory:

1. Thermometry

- 1.1 Define heat and temperature.
- 1.2 Mention the units of measurement of heat and temperature.
- 1.3 Distinguish between heat and temperature.
- 1.4 Identify the sources of heat.
- 1.5 Identify the range of the Celsius scale determined by the boiling point and melting point of water
- 1.6 Compare the Celsius scale, Roamer scale, Fahrenheit scale, Kelvin scale and Rankin scale of temperature measurement.
- 1.7 State the construction and graduation of a mercury thermometer.
- 1.8 Describe the operation of different types of thermometers (e.g., maximum and minimum thermometer, clinical thermometer).

2. Heat capacity of materials (calorimetric)

- 2.1 State the heat as a form of energy.
- 2.2 Define specific heat capacity.
- 2.3 State SI units of measurement of specific heat capacity as J/Kg° or J/Kgk° .
- 2.4 Define thermal capacity and water equivalent.
- 2.5 Differentiate between thermal capacity and water equivalent.
- 2.6 Mention the specific heat capacity of different materials.
- 2.7 Prove the total heat gained by an object is equal to the sum of the heat lost by all the surrounding objects.
- 2.8.1 Identify specific latent heat as the energy consumed or liberated when water vaporizes or condenses and when ice melts or freezes.
- 2.8.2 Explain the effects of a change in pressure on the melting point and boiling point of water.
- 2.9 Define various kinds of specific latent heat.
- 2.9.1 Determine the latent heat of fusion of ice and latent heat of vaporization of water.

3. Effects of heat on dimension of materials

- 3.1 Show that different materials change in size at different amounts with the same heat source.
- 3.2 Explain the meaning of differential expansion in bimetallic strip, thermostats, compensated pendulum etc.
- 3.3 Explain the methods of overcoming problems caused by the expansion of materials in buildings, machinery, railway lines and bridges.
- 3.4 Define the co-efficient of linear, superficial and cubical expansion of solids.
- 3.5 Mention the units co-efficient of linear, superficial and cubical expansion of solids.
- 3.6 Mention the linear, Superficial and cubical expansion of a range of common engineering materials.
- 3.7 Define real and apparent expansion of liquid.
- 3.8 Define and explain the co-efficient of real and apparent expansion of liquid.
- 3.9 Distinguish between the co-efficient of real and apparent expansion of liquid.
- 3.10 Determine the co-efficient of real and apparent expansion of liquid.

4. Heat transfer

- 4.1 Identify the phenomenon of heat transferring from hot bodies to cold bodies.
- 4.2 Explain the methods of heat transfer by conduction, convection and radiation with examples of each type of transfer.
- 4.3 Define thermal conductivity (K) & rate of heat transfer.
State the SI units of thermal conductivity as $\frac{W}{mk}$ or $\frac{W}{mc}$
- 4.4 List the factors which determine the quantity of heat (Q) flowing through a material.
- 4.5 Show that the quantity of heat flowing through a material can be found from $Q = \frac{KA (\theta_H - \theta_C)t}{d}$
- 4.6 Outline the properties of materials which give thermal insulation.
- 4.7 Explain Characteristics of radiant heat energy.
- 4.8 Describe Emissive power and absorptive power of radiant heat.
- 4.9 State Stefan-Boltzman Law,
- 4.10 State Newton's law of cooling.
- 4.11 State wiens law.
- 4.12 Explain Green house effect.

5. Nature of heat and its mechanical equivalent

- 5.1 Describe the caloric theory and kinetic theory of heat.
- 5.2 State the drawbacks of the caloric theory of heat.
- 5.3 Explain the mechanical equivalent of heat.
- 5.4 Explain the first law of thermodynamics.
- 5.5 Explain Isothermal and adiabatic change.

- 5.6 Explain Specific heat of a gas, Molar specific heat or molar heat capacity.
- 5.7 Relate between pressure and volume of a gas in adiabatic Change i, e; $PV^\gamma = \text{const.}$
- 5.8 Difference between C_p and C_v for an ideal gas ($C_p - C_v = R$)

6. 2nd law of thermodynamics

- 6.1 State and Explain Reversible process and irreversible process.
- 6.2 State & explain 2nd law of thermodynamics
- 6.3 Explain heat engine.
- 6.4 Explain the principle of work of a heat engine.
- 6.5 Identify thermal efficiency of a heat engine.
- 6.6 Explain the working principles of internal combustion and external combustion engines (with fair sketches)
- 6.7 Distinguish between internal combustion engine and external combustion engine. Entropy: Definition, unit and significant.
- 6.8 Explain Change of entropy in a reversible and irreversible process.
- 6.9 Give an example of increase of entropy in irreversible process.

7. Preliminaries of light and photometry

- 7.1 Define light, medium (transparent, translucent, opaque), luminous & non-luminous bodies, parallel, convergent & divergent rays, beam.
- 7.2 Show the travel of light in straight line.
- 7.3 Define photometry, luminous intensity, luminous flux, brightness and illuminating power.
- 7.4 Mention the units of luminous intensity, luminous flux, brightness and illuminating power.
- 7.5 Mention relation between luminous intensity & illuminating power.
- 7.6 Explain inverse square law of light.
- 7.7 Describe the practical uses of light waves in engineering.

8. Reflection of light

Define mirror (plane & spherical), image (real & virtual) and magnification of images.

Describe the reflection of light.

State the laws of reflection of light.

Express the verification of laws of reflection.

Define pole, principal axis, center of curvature, radius of curvature, principal focus in case of concave & convex mirrors.

Find the relation between focal length & radius of curvature of a concave & convex mirror.

Express the general equation of concave and convex mirror.

9. Refraction of light

- 9.1 Define refraction of light Give examples of refraction of light

- 9.2 State the laws of refraction and Express the verification of laws of refraction
- 9.3 Define absolute and relative refractive index and Relate absolute and relative refractive index
- 9.4 Explain the meaning of total internal reflection and critical angle and Relate total internal reflection and critical angle.
- 9.5 Give examples of total internal reflection.
- 9.6 Describe refraction of light through a prism.
- 9.7 Express the deduction of the relation between refractive index, minimum deviation and angle of the prism.
- 9.8 Explain Dispersion of light.
- 9.9 Define lens and mention the kinds of lens.
- 9.10 Define center of curvature, radius of curvature, principal axis, 1st and 2nd Principal focus, optical center and power of lens.
- 9.11 Express the deduction of the general equation of lens (concave & convex).
- 9.12 Define Combination of two thin lenses and equivalent lens.
- 9.13 Identify and List uses of lens.

10. Electron and photon :

Describe Electrical conductivity of gases.

Describe Discharge tube.

Cathode ray : Definition and its properties

X-ray : Definition, properties & uses

Discuss Photo electric effect.

Derive Einstein's photo electric equation

11. Structure of atom:

- 11.1 Atomic models: Thomson, Rutherford and Bohr model.
- 11.2 Bohr Hydrogen atom & the theory of hydrogen spectra.
- 11.3 Define and explain Radio activity.
- 11.4 Describe Radio active rays.
- 11.5 Deduce radioactive decay law.
- 11.6 Define half-life & mean life of radioactive atoms.
- 11.7 Define nuclear fission & fusion.

12. Theory of relativity :

- 12.1 Express the theory of relativity.
- 12.2 Mention different Kinds of theory of relativity.
- 12.3 Explain special theory of relativity and its fundamental postulate.
- 12.4 Deduce Einstein's mass -energy relation

PRACTICAL

1. Compare the operation of common thermometers.
2. Determine the co-efficient of linear expansion of a solid by Pullinger's apparatus.
3. Measure the specific heat capacity of various substances.(Brass, steel).
4. Determine the latent heat of fusion of ice.

5. Determine the water equivalent by calorimeter.
6. Compare the luminous intensity of two different light sources.
7. Verify the laws of reflection.
8. Find out the focal length of a concave mirror.
9. Determine the refractive index of a glass Slab.
10. Determine the angle of Minimum deviation and refractive index of a glass prism by using I-D graph.

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Computer application-I

T P C
0 6 2

OBJECTIVES.

- To develop skill to use computer and computer operating system.

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

SHORT DESCRIPTION

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

DETAIL DESCRIPTION

1. Show skill on computer hardware.

Identify the main components of Personal Computer.

Identify the CPU components and commonly used I/O devices and memories.

Identify Primary and secondary storage devices & demonstrate the maintenance of the devices.

Identify the allied equipment used with PC system(UPS, Stabilizer band IPS).

Make the cable connection of PC system, UPS and printer with power line.

Turn ON the power Switch and demonstrate booting effect of PC system.

2 Practice on windows operating system environment.

Observe the windows Screen and identify each item on desktop.

Show the function of start button & taskbar.

Start and quit programs.

Switch between programs.

Open and close a document.

Find something using find command.

Start a program by using run command.

3 Practice on customizing and configuring windows operating system.

Change system setting (say, system date, time, password, etc).

Configure the taskbar, shortcuts, desktop items etc.

Install driver software & configure printer, plotter, mouse & other PC equipment.

Use windows explorer for copy, move, delete or rename files and folder.

Add items to the start menu.

Create a shortcut on the desktop.

Customize windows i.e. desktop colors, patterns, wallpaper, screen saver, etc.

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

Use windows efficiently (i.e. copying, moving files quickly).

Organize your applications into groups (i.e. creating & deleting a group).

Install a new application program.

Back up, compare and restore files.

Freeze disk space (i.e.check your system's disk space, delete unnecessary files).

5 Practice on Disk Operating System (DOS).

Restart the computer in DOS mode.

use internal and external DOS commands.

Create, delete and view directories.
Change directories.
Use wild card in DOS mode.

6 Perform skill in managing disk.

Format and unformat a disk.
Create a system disk.
Make a system disk.
Restore directories and files.
Recover files from defective disks.

7 Perform skill in working with files and folder.

Organize files and folders.
Copy files (copy a single file, a group of files).
Rename a file.
Delete files (delete a single file, a group of files).
Copy directories & sub directories.
Show directories such as directory tree directory name, paths, and the current directory.

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

Run anti virus software (say Toolkit, Norton Anti virus, PC cillin, Kaspersky etc) and scan for viruses.
Protect the computer from viruses.
Run utility software such as PC, Tools, NC, NU, etc.
Use utility software for copying, renaming, deleting and moving folders or files.
Develop keyboard skills by standard touch typing rules using typing tutor packages.

9 Project1: Connect each part of a personal computer(PC) ,operate it with windows operating system and install / uninstall programs /softwares.

WORD PROCESSING:

10 Practice on creating a simple document using word processor.

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

11 Practice on working with graphics and drawing.

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

12 Show skill on managing file.

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

13 Show skill on formatting a document.

Change document margins.
Set margin with the page setup dialog box.
Drag margins in print preview.
Print in the margins.
Repaginate documents.
Force page breaks and force paragraphs to start on a new page.
Move and delete page breaks.
Keep things (lines, paragraphs, etc.) together on a page .

14 Show skill in selecting characters and fonts.

Format the character with the formatting toolbar.
Create and use different options of font dialog box.
Create keyboard shortcuts for character formatting.
Underline text (double, single, dotted, etc) and create bold
 Italicized character.
Expand and condense character spacing.
Create superscripts and subscripts and color character.
Demonstrate the change case command.
Remove and toggle to remove character formatting.
Type special characters and symbols using the symbol command.
Bullet the existing paragraphs.
Type new bullet lists, change bullet styles and specify custom bullets.

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

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

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

Create a simple table using table button & table menu.
Enter and edit text in a table.
Select cells, columns, rows group of cells and the whole table.
Add rows at the end and in the middle of a table, than delete rows.
Change row heights, and resize rows with cell height and width.
Change the spacing between rows.
Insert columns at the right edge and in the middle of a table, then delete the columns.
Change column and cell width with the ruler and the auto fit bottom.
Marge cells.
Change the space between columns merge different cells.

17 Project 2 : Create a complete document(such as a personal bio-data) with MS Word in Bengali and English using all necessary formating with graphics,table and save it in a created folder.

18 Practice on previewing & printing.

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

PRESENTATION SOFTWARE:

19 Create a PowerPoint Presentation.

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

20 Enhance powerpoint Presentation.

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

21. Perform attractive Presentation using MS PowerPoint.

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

22. Perform skill on Internet applications.

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

23. Perform skill on Electronic mailing system.

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

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Social science - I

T P C
2 0 2

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 Engineers.

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, consumption, 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 team.

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 Differentiate 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 availability 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 potential 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.
