



**BANGLADESH TECHNICAL EDUCATION BOARD**  
Agargoan, Dhaka-1207.

*4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM*  
SYLLABUS (PROBIDHAN-2016)

# **MECHANICAL TECHNOLOGY**

TECHNOLOGY CODE: **670**

4th SEMESTER

DIPLOMA IN ENGINEERING  
PROBIDHAN-2016

**MECHANICAL TECHNOLOGY (670)**

**4<sup>th</sup> 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	67041	Engineering Mechanics	3	3	4	60	90	25	25	200
2	67042	Metallurgy	2	3	3	40	60	25	25	150
3	67043	Machine Shop Practice -3	1	6	3	20	30	50	50	150
4	66631	Programming Essentials	2	3	3	40	60	25	25	150
5	66743	Electrical Circuits & Machines	3	3	4	60	90	25	25	200
6	69054	Environmental Studies	2	0	2	40	60	0	0	100
7	65841	Business Organization & Communication	2	0	2	40	60	0	0	100
<b>Total</b>			<b>15</b>	<b>18</b>	<b>21</b>	<b>300</b>	<b>450</b>	<b>150</b>	<b>150</b>	<b>1050</b>

**AIMS:**

- To facilitate understanding the fundamental of units and their conversions.
- To provide the understanding of force, effect of the force, composition and resolution of forces and computing the resultant force & couple
- To provide the understanding of parallel forces, to provide understanding the centroid and enable to computing the center of gravity & the moment of inertia.
- To enable to understand the laws of friction and the coefficient of friction & the ability of computing frictional forces of reactions of surfaces.
- To provide to understanding of deriving support reactions and types of loading of beam and trusses.
- To facilitate the understanding of work, power, energy, projectile lifting machine and gear trains.

**SHORT DESCRIPTION**

Fundamental of mechanics and unit conversion, Composition and resolution of forces. Moment and their applications. Equilibrium of force and couples, centroid and center of gravity, moment of inertia. Friction, support reactions, frame and truss, projectiles, work, power and energy, lifting machine, gear trains.

**Theory:****1. Understand Fundamental of Mechanics.**

- 1.1. Define mechanics.
- 1.2. Classify applied mechanics.
- 1.3. Importance of units in the engineering field.
- 1.4. Discuss the conversion of units.
- 1.5. Illustrate the fundamental mathematics (algebra, trigonometry & calculus) used in mechanics.

**2. Understand the composition and resolution of forces.**

- 2.1. State the effect and characteristics of a force.
- 2.2. Describe different system of forces.
- 2.3. Describe resultant force and composition of forces.
- 2.4. Find the resultant force graphically and analytically.
- 2.5. State the laws of forces.
- 2.6. Define resolution of a force.
- 2.7. Deduce the formula for finding the rectangular components.
- 2.8. Find the magnitude and position of the resultant force graphically and analytically
- 2.9. Solve problems related to resultant force.

**3. Understand the aspects of moment of forces and couples.**

- 3.1. Define moment of force and mention the units of moment.
- 3.2. Identify the clockwise and anticlockwise moment.
- 3.3. State the Varignon's principle of moments.
- 3.4. State the laws of moments.
- 3.5. Define and classify the lever.
- 3.6. State and classify parallel forces.

- 3.7. Define and classify a couple.
- 3.8. Solve the problems related to couple.
- 3.9. Solve problems related to moment of forces and couple.

**4. Understand the aspects of equilibrium of forces.**

- 4.1. State the principles of equilibrium of forces.
- 4.2. State the Lami's theorem.
- 4.3. Express the derivation of Lami's theorem.
- 4.4. Describe different methods of the equilibrium of coplanar forces and non-coplanar forces.
- 4.5. Explain the conditions of equilibrium.
- 4.6. Mention the various types of equilibrium of forces.
- 4.7. Solve problems related to equilibrium of forces.

**5. Understand the concept of centroid and center of gravity.**

- 5.1. Define center of gravity and centroid.
- 5.2. Distinguish between center of gravity and centroid.
- 5.3. Explain the methods of finding out centroid of simple geometrical figure.
- 5.4. Identify the axis of reference and axis of symmetry.
- 5.5. Determine the centroid of rectangle, triangle, semicircle geometrically and by integration.
- 5.6. Determine the centroid of plain geometrical figure by principle of first moments.
- 5.7. Calculate the centroid of various composite areas.
- 5.8. Calculate the center of gravity of solid bodies.

**6. Understand the application of moment of inertia.**

- 6.1. Explain the term moment of inertia and the units of moment of inertia.
- 6.2. Express the derivation of the formulae for moment of inertia of an area.
- 6.3. Describe the methods for finding out the moment of inertia.
- 6.4. Find the moment of inertia of simple areas by the method of integration.
- 6.5. State and prove the theorem of perpendicular axis as applied to moment of inertia.
- 6.6. State the parallel axis theorem in the determination of moment of inertia of areas.
- 6.7. Explain the radius of gyration and section modulus.
- 6.8. Define mass moment of inertia.
- 6.9. Application of mass moment of inertia.
- 6.10. Calculate the moment of inertia and section modulus of composite sections and simple solid bodies.

**7. Understand the principles and application of friction**

- 7.1. Define friction.
- 7.2. Advantage and disadvantage of friction.
- 7.3. Identify the types of friction.
- 7.4. State the laws of static and dynamic friction.
- 7.5. Explain the angle of friction.
- 7.6. Explain coefficient of friction.
- 7.7. Explain free body diagrams of a body lying on horizontal, inclined and vertical surfaces, ladder and wedge.
- 7.8. Determine the frictional force of a body lying on horizontal and inclined surfaces.
- 7.9. Identify the methods of solving the problems of ladder
- 7.10. Identify the methods of solving the problems of wedge.

## **8. Understand the fundamentals of support reaction on beams and Truss**

- 8.1. Define support and support reactions.
- 8.2. Identify types of beam.
- 8.3. Explain the types of loading on beams.
- 8.4. Determine the support reactions of simple, overhanging and cantilever beam with different loading conditions.
- 8.5. Define frame.
- 8.6. Identify the frames and trusses with their end supports.
- 8.7. State the method of finding support reactions and forces on the member of the frame.
- 8.8. Identify the nature of force on the members of trusses.
- 8.9. Calculate the support reactions and forces on different end support of simple truss by joint method and section method.

## **9. Understand the features and principle of projectile.**

- 9.1. Describe projectiles with example.
- 9.2. Describe the term relating to projectiles.
- 9.3. Identify the motion of a body thrown horizontally in the air.
- 9.4. Describe the motion of a projectile.
- 9.5. Derivation of the equation of the path of a projectile.
- 9.6. Derivation of the time of flight of a projectile on a horizontal plane.
- 9.7. Derivation of horizontal range of a projectile.
- 9.8. Derivation of the equation of maximum height of a projectile on a horizontal plane.
- 9.9. Derivation of velocity and direction of motion of a projectile after a given interval of time.
- 9.10. Solve problems related to projectiles.

## **10. Understand the aspects of work, power and energy.**

- 10.1. Define work, power and energy.
- 10.2. State the units of work, power and energy.
- 10.3. Explain the work done in rotation.
- 10.4. Mention the types of engine power.
- 10.5. Define and classify engine efficiency.
- 10.6. Mention types of energy.
- 10.7. Explain the derivation of the equation of kinetic & potential energy.
- 10.8. State the law of conservation of energy.
- 10.9. Solve problems related to work, power and energy.

## **11. Understand the simple lifting machines.**

- 11.1. Define lifting machine.
- 11.2. State Mechanical advantage, velocity ratio, input of a machine, output of a machine, efficiency of a machine.
- 11.3. Explain the relation between efficiency, mechanical advantage and velocity ration of a lifting machine.
- 11.4. Explain the maximum mechanical advantage of a lifting machine by using the equation of law's of machine.
- 11.5. Describe lifting machine such as simple wheel & axel, differential wheel & axel, Weston's differential pulley block and geared pulley block.
- 11.6. Solve the problems related to above specific objects.

## **12. Understand the various aspects of gear trains.**

- 12.1. State what is meant by gear.
- 12.2. Identify the types of gears.
- 12.3. Identify the simple gear drive.
- 12.4. Express the derivation of the equation of velocity ratio of simple gear drive.
- 12.5. Identify the compound gear drive and gear train.
- 12.6. Identify the equation of power transmitted by simple and compound train.
- 12.7. Identify the epicyclical gear train.
- 12.8. Express the derivation of the velocity ratio of an epicyclical gear train.
- 12.9. Solve problems related to gear trains.

## **PRACTICAL:**

### **1. Determine the resultant force by using force board.**

- 1.1 Set up the force board.
- 1.2 Set up the accessories on the force board.
- 1.3 Find the resultant force.
- 1.4 Calculate the magnitude of resultant force.
- 1.5 Compare the calculated values with experimental values.

### **2. Determine the compression load using crane boom.**

- 2.1 Set up the crane boom.
- 2.2 Set up the accessories on the crane boom.
- 2.3 Find the compression load on the jib.
- 2.4 Calculate the compression analytically.
- 2.5 Compare the experimental values with analytical values.

### **3. Determine the equilibrium force by using Kennon force table.**

- 3.1 Set up the Kennon force table.
- 3.2 Set up the accessories on the Kennon force table.
- 3.3 Find the magnitude and direction of a force establishing equilibrium.
- 3.4 Calculate the magnitude and direction of equilibrium force.
- 3.5 Compare the calculated values with experimental values.

### **4. Determine the center of a triangular lamina.**

- 4.1 Select a triangular lamina and a plumb bob.
- 4.2 Set up the plumb bob.
- 4.3 Find the center point of the triangular lamina.

### **5. Determine the center of gravity of solid body.**

- 5.1 Select solid bodies such as solid rod, step rod and body with cut out holes.
- 5.2 Select a fulcrum.
- 5.3 Set up the fulcrum.
- 5.4 Find the center point.
- 5.5 Compare the analytical values with experimental values.

### **6. Determine the co-efficient of friction.**

- 6.1 Set up the friction apparatus.
- 6.2 Select the materials of which coefficient of friction is to be determined.
- 6.3 Place the materials over each other.
- 6.4 Raise one end of the body until the other body slides down.
- 6.5 Find the angle of friction.

6.6 Find the co-efficient of friction.

**7. Determine the action of load on the member of simple frame or truss.**

7.1 Select two members of which one end roller and other end pin point.

7.2 Select a tension spring.

7.3 Make a unit as a simple frame or truss.

7.4 Apply the load.

7.5 Read the tension load on spring.

**8. Determine the torque of engine by prony brake.**

8.1 Set up the prony brake with the engine flywheel.

8.2 Tighten the hand wheel of prony brake.

8.3 Measure the length of torque arm.

8.4 Start the engine.

8.5 Take the reading of spring scale.

8.6 Find the torque of engine.

8.7 Compare the calculated values with the manufacturers' recommended values.

**9. Determine the BHP of an engine by chassis dynamometer.**

9.1 Place the vehicle on chassis dynamometer.

9.2 Start the vehicle engine.

9.3 Transmit power at different gear position.

9.4 Find the B. H. P. of the engine by chassis dynamometer at different speeds.

9.5 Compare the experimental value with the manufactures' recommended value.

**10. Determine the velocity ratios among the driver and driven gears.**

10.1 Set a simple train of gears.

10.2 Compare the velocity ratios of the same.

10.3 Set a compound train of gears.

10.4 Compare the velocity ratios of the same.

**REFERENCE BOOKS**

- 1 Applied Mechanics – R. S. Khurmi
- 2 Applied Mechanics – R. K. Jain
- 3 Applied Mechanics – Fairries
- 4 Analytical Mechanics – Faires & Nash
- 5 Mechanics of Materials – Morgan

**AIMS:**

- To be able to identify and classify the materials used for metallurgical engineering field.
- To be able to recognize the sources of various Metals.
- To be able to understand the characteristics of various ferrous and non-ferrous metals.
- To be able to understand the uses of different alloy.
- To be able to understand the application of Powder Metallurgy.

**SHORT DESCRIPTION**

Concept and Scope of Metallurgy; Uses of Metallic Ore; Production of Pig Iron; Production of Wrought Iron; Feature of Cast Iron ; Plain Carbon Steel; Bessemer, Open Hearth , Crucible Process for Making Steel; Process of making Steel by Electric Furnace; Aspect of Alloy Steel; Aspect of non-ferrous metals; Feature of Alloy of Metals; Application of Powder Metallurgy in Engineering Production.

**DETAIL DESCRIPTION****1. Understand the Concept and Scope of Metallurgy.**

- 1.1 Define metallurgy.
- 1.2 Mention the classification of metallurgy as applied to manufacturing engineering and production.
- 1.3 Mention the use of metallurgical investigation in industry.
- 1.4 Mention the physical and mechanical properties of metals.

**2. Understand the Uses of Metallic Ore**

- 2.1 Define ores of metals.
- 2.2 Mention the classification of ores of metals.
- 2.3 Describe the processing of ores before melting.
- 2.4 Name the metallic ores available in Bangladesh.
- 2.5 Define refractory materials.

**3. Understand the Production of Pig Iron**

- 3.1 Define pig iron.
- 3.2 Describe the importance of blast furnace.

**4. Mention the construction of blast furnace.**

- 4.1 Explain the operation of blast furnace.
- 4.2 Describe the chemical reaction caused in the blast furnace for pig iron Production.
- 4.3 Describe the elements of slag use in of blast furnace.

**5. Understand the Wrought Iron and its uses.**

- 5.1 Mention the meaning of wrought iron.
- 5.2 Describe the properties of wrought iron
- 5.3 Mention the use of wrought iron.

**6. Understand the Feature of Cast Iron.**

- 6.1 Define cast iron.
- 6.2 Mention the manufacturing process of cast iron.
- 6.3 List the types of cast iron.
- 6.4 Explain the composition of various cast iron.
- 6.5 Mention the properties of various cast iron.



6.6 Mention the effect of sulphur, phosphorous, aluminum and silicon on the properties of cast iron.

6.7 Explain the domestic and industrial uses of cast iron.

## **7. Understand the Plain Carbon Steel.**

7.1 Name the types of plain carbon steel.

7.2 Explain the composition of plain carbon steel.

7.3 List the use of different plain carbon steel.

7.4 Mention the process of making steel adapted in Bangladesh.

## **8. Understand the Bessemer, Open Hearth & Crucible Processes for Making Steel.**

8.1 Describe the construction of Bessemer converter.

8.2 Distinguish between the basic Bessemer process and acid Bessemer process of making steel.

8.3 Describe the construction of open hearth furnace.

8.4 Describe the steel production using open hearth furnace.

8.5 Mention the construction of crucible.

8.6 Mention the crucible process of making steel.

8.7 Explain the advantage of making steel by crucible process and other process.

8.8 State the reason of adopting the duplexing and triplexing process of making steel.

## **9. Understand the Process of making Steel by Electric Furnace.**

9.1 Explain the construction of electric furnace.

9.2 Mention the classification of electric furnace.

9.3 Mention the process of making steel by direct arc electric furnace.

9.4 Describe the process of making steel by induction electric furnace.

9.5 Mention the reason for superiority of electric furnace steel than others.

## **10. Understand the Aspect of Alloy Steel.**

10.1 Mention the classification of alloy steel.

10.2 Explain the difference between alloy steel and plain carbon steel.

10.3 Describe the manufacturing process of stainless steel, high speed steel and nickel steel.

10.4 Describe the composition of stainless steel, high speed steel, tungsten steel, molybdenum steel, chromium steel, nickel steel and silicon steel.

10.5 Describe the effect of manganese, tungsten, molybdenum, chromium, nickel, vanadium, copper, sulphur, phosphorous and silicon on the mechanical properties of alloy steel.

10.6 Describe the domestic and industrial uses of stainless steel, high speed steel, tungsten steel, molybdenum steel, chromium steel, nickel steel and silicon steel.

## **11. Understand the Aspect of Non-ferrous Metals and Alloy of Metals**

11.1 Mention the important properties of Aluminum and Copper.

11.2 Describe the uses of Aluminum, Copper, Zinc, Tin and Lead.

11.3 Define alloy of metals.

11.4 Describe the compositions, properties and uses of important alloys of Aluminum, Copper, Zinc, Tin, Lead, Antimony and Nickel.

11.5 Describe the process of making alloys of Aluminum, Copper, Zinc, Tin, Lead, Antimony and Nickel.

## **12. Understand the Application of Powder Metallurgy in Engineering Production.**

12.1 Define powder metallurgy.

12.2 List the importance of powder metallurgy.

12.3 Explain the methods of producing metal powder.

12.4 Mention the production method of metal powder components.

12.5 Describe the special properties of metal powder products.

12.6 List the major applications advantages of metal powder products.

## **PRACTICAL:**

### **1. Show skill in identifying various types of metals.**

- 1.1 Select different types of metal in the laboratory.
- 1.2 Sketch different types of metal on the basis of formation.

### **2. Show skill in workshop test of metals.**

- 2.1 Perform Rockwell Hardness test.
- 2.2 Perform Brinell Hardness number using standard specimen.

### **3. Show skill in identifying various ferrous and nonferrous metals.**

### **4. Identify different types of alloy steel.**

### **5. Determine Grain number of specimen using metallurgical microscope.**

- 5.1 Collect the sample.
- 5.2 Grind the specimen.
- 5.3 Polish and each the specimen.
- 5.4 Observe microstructure.
- 5.5 Measure, calculate and find grain number.

### **6. Show the construction and operation process of electric furnace of making steel.**

## **REFERENCE BOOKS**

1. Metallurgy - Johnson
2. Emergency Metallurgy - Frier.
3. Metallurgy - Jain.
4. Metallurgy - R S Khurmi
5. Introduction to Physical Metallurgy- Sidney H. Avner.
6. Material Science and Metallurgy - O P Khanna

**OBJECTIVES**

- To enable understanding the features of specialized machine tools.
- To enable developing skills in set up and operation of specialized machine tools.
- To enable understanding and performing advanced operations on specified machine tools.
- To produce engineering parts using the machine tools.
- To enable developing skills in the set up and operations of Shaper, CNC Milling and precision grinding machine.

**SHORT DESCRIPTION**

Precision Grinding machine, Tool and cutter grinding machine, Jig borer and Jig Grinder, Shaper machine, Planer machine, CNC Milling Machine, Engraving machine, Super finishing machine, Measuring and operating techniques.

**DETAIL DESCRIPTION****Theory:****1. Understand Precision Grinding Machine.**

- 1.1 Define precision grinding.
- 1.2 Classify precision grinding machine.
- 1.3 Describe cylindrical and surface grinding operations.
- 1.4 Explain center type grinding
- 1.5 Describe center less type grinding machine
- 1.6 Describe internal grinding process.
- 1.7 Mention the procedure of crankshaft grinding.
- 1.8 Describe pneumatic grinding.
- 1.9 State safety precautions during working on precision grinder.

**2. Understand Tool and Cutter Grinder.**

- 2.1 State the bonding materials of grinding wheel.
- 2.2 State the principles of tool and cutter grinder.
- 2.3 Mention the main parts of tool and cutter grinder.
- 2.4 Mention the Components, attachment and accessories for tool and cutter grinder.
- 2.5 Describe uses of the various standard cutter grinders.
- 2.6 List the various attachments of the cutter grinding wheel.
- 2.7 Describe methods of sharpening cutting tools.
- 2.8 State safety precautions during working on tool and cutter grinder.

**3. Understand Jig Borer and Jig Grinder.**

- 3.1 State general description of jig borer and jig grinder.
- 3.2 Mention components and accessories of jig borer and jig grinder.
- 3.3 Mention work holding devices in jig borer and jig grinder.

- 3.4 Describe methods of locating and coordinate system.
- 3.5 Mention measurements and inspection of bores.
- 3.6 Mention different types of grinding wheels used in jig grinder.
- 3.7 State safety precautions during working on jig borer and jig grinder.

**4. Understand the application of Shaper.**

- 4.1 Define and classify shaping machines.
- 4.2 Identify different components of shaping machine and their uses.
- 4.3 Describe the quick return mechanism ram stroke length and cutting speed adjustments.
- 4.4 Mention Setting technique of a work piece on the machine table of shaper.
- 4.5 Identify and describe typical operations for shaper.
- 4.6 Mention Specification of shaper machine.
- 4.7 State safety precautions during working on the shaper.

**5. Understand the application of Planer.**

- 5.1 Define and classify planer machine.
- 5.2 Identify major components of planer machine.
- 5.3 Explain how to set a work piece on the machine table of planer.
- 5.4 Identify typical operations for planer.
- 5.5 Distinguish between shaper and planer.
- 5.6 State safety precautions during working on the planer.

**6. Understand CNC Milling Machine.**

- 6.1 Describe CNC milling machine.
- 6.2 Mention functions of major components of CNC milling machine.
- 6.3 Differentiate between CNC milling machine and CNC machining centre machine.
- 6.4 Mention specification of CNC milling machine and CNC machining centre machine.
- 6.5 Describe programming of CNC machining centre machine
- 6.6 State Safety precautions during CNC milling.

**7. Understand the Engraving and CNC Router Machine.**

- 7.1 Define CNC Router and engraving machine.
- 7.2 Mention functions of engraving machine.
- 7.3 Mention functions of CNC Router Machine
- 7.4 Mention components and accessories of engraving machine.
- 7.5 Mention components and accessories of CNC Router Machine.
- 7.6 State uses of the various engraving machine.
- 7.7 State uses of the various CNC Router machine

**8. Understand the Super Finishing Machine.**

- 8.1 Define super finishing.
- 8.2 Mention types of machines used in super finishing technique.
- 8.3 Describe Honning operation.
- 8.4 Describe lapping operation.
- 8.5 State application of Honning and lapping.
- 8.6 State safety precautions during Honning and Lapping operation.

## **Practical:**

### **1. Perform special operations on Precision Grinding Machine.**

- 1.1 Mount and balance the grinding wheel.
- 1.2 Perform setting up grinding machine, work piece and cutting tool,
- 1.3 Perform grinding on a flat surface.
- 1.4 Perform grinding on a cylindrical surface.
- 1.5 Perform grinding on a flat position.
- 1.6 Set up tools and work piece on tool and cutter grinder.
- 1.7 Perform different angles sharpening operations of a single point cutting tool, a twist drill bit and a milling cutter by tools and cutter grinder.
- 1.8 Practice safety precautions of precision grinding.

### **2. Perform operations of Shaper Machine.**

- 2.1 Perform simple setting up of machine, mounting work piece, tool bit, speed and feeds, ram position and stroke.
- 2.2 Carry out machining operation for parallel shaping and vertical face shaping.
- 2.3 Produce a simple job according to an engineering drawing specification.
- 2.4 Practice safety precautions of Shaping.

### **3. Demonstrate Jig borer and Jig Grinder.**

- 3.1 Perform simple setting up of jig borer and jig grinder, work piece.
- 3.2 Carry out measurement and inspection of holes.
- 3.3 Perform a job according to an engineering drawing.
- 3.4 Practice safety precautions of boring and grinding.

### **4. Demonstrate CNC milling operation.**

- 4.1 Demonstrate elements of CNC Milling machine.
- 4.2 Set up machine axes.
- 4.3 Set up work offset.
- 4.4 Set up tool offset.
- 4.5 Loading tool and holding work piece.
- 4.6 Program the CNC Milling operation for a specified job.
- 4.7 Produce a job according to an engineering drawing.
- 4.8 Practice workshop safety precautions of CNC Milling.

### **5. Produce engineering components those require various machining operations (e.g. Lathe, Drilling, Shaping, Milling, Grinding etc.).**

## **REFERENCE BOOKS**

1. Basic Machine Shop Practice I & II — V. K. Tejwani
2. Workshop Technology I, II & III — W. A. J. Chapman
3. Machine Shop Practice I & II — Berghardt
4. Machine Shop Practice — Somenath De
5. CNC Programming Hand Book — Peter Smid
6. CNC Milling in the Workshop — Marcus Bowman
7. CNC Handbook — Hans B. Kief, Helmut A. Roschiwal

**OBJECTIVES**

- To develop knowledge and skill on programming Basics.
- To develop knowledge and skill to create, compile, debug & execute a program.

**SHORT DESCRIPTION**

Basics of programming Language; Basics of Python; Variables; Data types; Strings; Operators; Decision making and Looping statements; Lists; Tuples; Functions; File operations;

**DETAIL DESCRIPTION****Theory:****1. Basics of Programming.**

- 1.1. State Computer Program and Programming.
- 1.2. Explain Programming Language and its classification.
- 1.3. State Generation of Programming Languages.
- 1.4. Describe Translator Program.
- 1.5. Uses of Computer Programs.
- 1.6. Describe Algorithm and Flowchart.
- 1.7. Prepare Algorithm and Flowchart for simple problems.
- 1.8. Explain the Process of Program Planning.

**2. Basics of Python.**

- 2.1. Describe the History of Python.
- 2.2. Explain the features of Python.
- 2.3. Describe the Structure of Python Program.
- 2.4. State Identifiers and Keywords.
- 2.5. State Lines, Indentation, Multi-Line Statements and Multiple Statements on a Single Line.
- 2.6. State Quotation and Comments in Python.
- 2.7. State Command Line Arguments.

**3. Variable and Data Types.**

- 3.1. Assigning Values to Variables.
- 3.2. State Multiple Assignment.
- 3.3. Describe Standard Data Types.
- 3.4. Explain Data Type Conversion.

**4. STRINGS.**

- 4.1. State Accessing Values in Strings and Updating Strings.
- 4.2. Uses of Escape Characters.
- 4.3. Explain String Special Operators and String Formatting Operator.
- 4.4. Describe Triple Quotes and Unicode String.
- 4.5. Write Simple programs using strings.

**5. PYTHON OPERATORS.**

- 5.1. State Operators and their types.
- 5.2. Describe Arithmetic Operators, Comparison Operators and Logical Operators.
- 5.3. State Assignment Operators, Bitwise Operators and Membership Operators Identity Operators.
- 5.4. Explain Operators Precedence.

## **6. DECISION MAKING.**

- 6.1. Describe the conditional and unconditional branching flow.
- 6.2. Explain If Statement and If...else Statement.
- 6.3. State the nested if Statement.
- 6.4. Write simple program using if, if...else and nested if.

## **7. LOOPS.**

- 7.1. Describe the conditional and unconditional Looping flow.
- 7.2. State For Loop.
- 7.3. State While Loop.
- 7.4. Explain The Infinite Loop and Nested Loops.
- 7.5. State Break, Continue and pass Statement.
- 7.6. Write simple program using for and while loop.

## **8. LISTS**

- 8.1. Define Lists and its type.
- 8.2. Assigning Values in Lists.
- 8.3. Explain Updating and Deleting List Elements.
- 8.4. State Basic List Operations.
- 8.5. Explain Built-in List Functions and Methods.
- 8.6. Write simple program using Lists.

## **9. TUPLES**

- 9.1. Assigning Values in Tuples.
- 9.2. Explain Updating and Deleting Tuple Elements.
- 9.3. Describe Basic Tuples Operations.
- 9.4. State No Enclosing Delimiters.
- 9.5. Explain Built-in Tuple Functions.
- 9.6. Write simple program using Tuples.

## **10. FUNCTIONS**

- 10.1. Defining a Function.
- 10.2. State Calling a Function.
- 10.3. Explain Passing by Reference Versus Passing by Value.
- 10.4. Describe Function Arguments.
- 10.5. Uses of Date and Time Functions.
- 10.6. Write simple program using functions.

## **11. FILES I/O**

- 11.1. Printing to the Screen.
- 11.2. Reading Keyboard Input.
- 11.3. Uses of input Function.
- 11.4. Describe Opening and Closing Files.
- 11.5. Explain Reading and Writing Files.

## **PRACTICAL:**

**Perform skill to create, compile, debug & execute programs to solve specific problems.**

### **1. Simple programs using basic structure of a programming Language (Python).**

- 1.1. A program for printing a message.
- 1.2. A program for adding two integer numbers.

## **2. Simple programs using variables**

- 2.1. A program to calculate the average of a set of N numbers.
- 2.2. A program to convert the given temperature in Fahrenheit to Celsius and vice versa.
- 2.3. A program to calculate the area of a circle.
- 2.4. Write similar programs using variables.

## **3. Programs using operators**

- 3.1. A program to convert days to months and days.
- 3.2. A program to calculate the area of a triangle.
- 3.3.** A program to compare two integer numbers.
- 3.4. Write similar programs using operators.

## **4. Programs using Branching Statements.**

- 4.1. A program to select and print the largest of the three numbers.
- 4.2. A program to compute the roots of a quadratic equation.
- 4.3. Write similar programs using Branching Statements.

## **5. Programs using Looping Statements**

- 5.1. A program to print odd or even numbers from 1 to 100.
- 5.2. A program to find the maximum or minimum number from a set of numbers
- 5.3. A program for searching prime numbers.
- 5.4. Write similar programs using Loop Statements.

## **6. Programs using Lists.**

- 6.1. A program to sort numbers in ascending or descending order using one dimensional array.
- 6.2. A program to print numbers in two dimensional forms.
- 6.3. Write similar programs using Lists.

## **7. Programs using functions.**

- 7.1. A program to calculate the area of a triangle using function.
- 7.2. A program that uses a function to sort an array of integers.
- 7.3. A program to calculate factorial of any integer using recursive function.
- 7.4. Write similar programs using functions.

## **8. Programs using files.**

- 8.1. A program to store information to or to read information from file.
- 8.2. Write similar programs using files.

## **REFERENCE BOOKS:**

1. Learning Python – Mark Lutz
2. Website List:
  - [http:// python.howtocode.com.bd](http://python.howtocode.com.bd)
  - [http:// www.learnpython.org](http://www.learnpython.org)
  - <http://pythontutor.com>



**OBJECTIVES:**

To provide the student with an opportunity to acquire knowledge, skill and attitude in the area of Electrical circuits and machines with special emphasis on:

- Provide understanding and skill on AC circuits.
- Develop concept of poly phase system.
- Familiarize with the construction and operating principle of transformer.
- Develop understanding of the principles of DC motor.
- Develop knowledge and skill of 1-phase and 3-phase induction motor.
- Develop understanding of the principle of synchronous motor.

**SHORT DESCRIPTION**

Complex algebra – application to AC circuits; RLC series and parallel circuits; Poly phase system; Star and delta connection; Transformer; DC motor; 3-phase induction motor; 1-phase induction motor; Synchronous motor and stepper motor.

**DETAIL DESCRIPTION****Theory:****1 Apply the Principle of Scalar and vector Quantities.**

- 1.1 Define the concept of Scalar and Vector Quantities.
- 1.2 Explain the Vector representation of alternating voltage and current.
- 1.3 Explain the Vector in polar and rectangular form.
- 1.4 Formulate the relation between Vectors Expressed in rectangular and polar co-ordinate.
- 1.5 Solve problems related to Vector sum and difference, multiplication and division.

**2 Apply the concept of AC series and Parallel circuits containing resistor, Inductor and Capacitor.**

- 2.1 Draw the circuit containing resistor, Inductor and Capacitor.
- 2.2 Draw the Vector diagram of RLC series circuit.
- 2.3 Derive the Impedance equation of RLC series circuit in Rectangular form and polar form notation.
- 2.4 Solve problems of RLC series circuit in rectangular co-ordinate system and polar co- ordinate system.
- 2.5 Draw the circuit containing resistor, Inductor and Capacitor In parallel.
- 2.6 Draw the Vector diagram of RLC parallel circuit.
- 2.7 Derive the Admittance of parallel AC circuit in Rectangular and polar form notation.
- 2.8 Solve problems on parallel Ac circuit in Rectangular and polar form notation.

**3 Understand the application of complex algebra for power calculation.**

- 3.1 Calculate power employing complex form.
- 3.2 Calculate VAR employing complex form.
- 3.3 Describe the conjugate method of calculating Real power.
- 3.4 Describe the conjugate method of calculating Reactive power.

**4 Understand the concept of poly-phase system.**

- 4.1 State the term poly-phase system.
- 4.2 List the advantages of poly-phase system over single phase system.
- 4.3 State the generation of poly-phase emf.
- 4.4 Sketch the phase voltage wave diagram.
- 4.5 Identify the phase sequence of poly-phase system.
- 4.6 State the effects of reverse phase sequence.

**5 Apply the concept of poly phase for interconnection.**

- 5.1 Write down possible ways of interconnection of three phase system.
- 5.2 Draw the circuit diagram of star connected 3-phase, 3-wire system.
- 5.3 List the application of 3-phase, 3-wire, star connected system.
- 5.4 Sketch 3-phase, 4-wire, star connection system.
- 5.5 List application of 3-phase, 4-wire star connection system.

**6 Understand the function of 3-phase star connection system.**

- 6.1 Define the concept of Balance and Unbalance System
- 6.2 Find neutral wire in a 3-phase star connection system.
- 6.3 Evaluate the current in the neutral wire in a balanced 3-phase, 4-wire, star connected system.
- 6.4 Draw the phasor diagram of 3-phase, 4-wire star connected system.
- 6.5 Discuss the formula  $I_L = I_p$  and  $V_L = \sqrt{3} V_p$
- 6.6 Calculate volt-ampere, power and power factor in a balanced 3-phase, 4-wire star connected system.
- 6.7 Solve problems on star connected (balanced) power system.

**7 Understand the features of 3-phase delta connection system.**

- 7.1 Draw the circuit diagram of a 3-phase delta connected system.
- 7.2 Draw the phasor diagram of delta connected system.
- 7.3 Express the deduction of the formula  $V_L = V_p$  and  $I_L = \sqrt{3} I_p$  for connected system.
- 7.4 Calculate the volt-ampere, power and power factor in a balanced 3-phase, delta connected system.
- 7.5 Solve problems on delta connected balanced system.
- 7.6 Compare the advantages of star connected system with those of delta connected system.

**8 Understand the principle of operation of transformer.**

- 8.1 Define the concept of transformer.
- 8.2 Mention different types and Uses of transformers.
- 8.3 Explain the working principle of transformer.
- 8.4 Derive the emf equation of a transformer.
- 8.5 Explain transformation ratio (voltage, current and turns).
- 8.6 List the different types of losses in transformer.
- 8.7 Explain the factors affecting core loss and copper loss.
- 8.8 Deduct the equation for voltage regulation of a transformer.
- 8.9 Solve problems on transformation ratio and emf equation of Transformer.

**9 Understand the principle of DC motor.**

- 9.1 Define the concept of DC motor.
- 9.2 Specify different types of DC motor.
- 9.3 Explain the working principle of DC motor.
- 9.4 Explain generator action of motor.
- 9.5 Describe the constructional features of DC motor.
- 9.6 Clarify the function of commutator.
- 9.7 Describe starting methods of DC motor.
- 9.8 Illustrate speed control of DC motor.

**10 Understand the principle of induction motor.**

- 10.1 Explain the principle of induction motor.
- 10.2 Mention the types of Single phase and three phase induction motor.
- 10.3 Distinguish between the principles of induction motor and
- 10.4 Define slip and slip speed.
- 10.5 Explain the construction of 3-phase induction motor.
- 10.6 List the uses of Single phase and 3-phase induction motor.
- 10.7 Describe the methods of starting 3-phase induction motor.
- 10.8 State the principles of speed control of 3-phase induction motor.

**11 Understand the working principle of 1-phase induction motor.**

- 11.1 Explain working principle of 1-phase induction motor.
- 11.2 Explain the self starting method of single phase motor.
- 11.3 Describe the principles of operation of standard split phase motor.
- 11.4 Describe the principles of operation of capacitor motor.
- 11.5 Describe the principles of operation of shaded pole motor and repulsion motor.
- 11.6 Mention the Uses of hysteresis motor, universal motor, reluctance motor and AC series motor.
- 11.7 Mention the methods of speed control of single phase induction motor.

**12 Understand the working principle of synchronous motor and Stepper motor.**

- 12.1 Explain the principle of operation of synchronous motor.
- 12.2 Describe the constructional features of synchronous motor.
- 12.3 Describe the starting methods of synchronous motor.
- 12.4 Explain the working principle of stepper motor.
- 12.5 List the different types of stepper motor.
- 12.6 Describe construction of different stepper motors.

**PRACTICAL:**

**1 Determine the value of resistance, inductance & capacitance and draw vector diagram of RLC series circuit.**

- 1.1 Sketch the circuit diagram for RLC series circuit.
- 1.2 Select equipment, tools & materials for the experiment.
- 1.3 Connect the circuit according to the circuit diagram.
- 1.4 Check all connection points before energizing the circuit.
- 1.5 Record the readings from the meter connecting power supply to the circuit.
- 1.6 Find the values of resistance, inductance, capacitance and phase angle from the relevant data.
- 1.7 Verify the impressed voltage is equal to the vector sum of voltage drops in each parameter.
- 1.8 Sketch the vector diagram with the help of relevant data as obtained.

**2 Determine the values of resistance, inductance, capacitance and draw the vector diagram of RLC parallel circuit.**

- 2.1 Sketch the circuit diagram for RLC parallel circuit.
- 2.2 Select equipment, tools & materials for the experiment.
- 2.3 Connect the circuit according to the circuit diagram.
- 2.4 Check all connection points before energize the circuit.
- 2.5 Record the readings from the meter connecting power supply to the circuit.
- 2.6 Find the value of resistance, inductance, capacitance and phase angle from the relevant data.
- 2.7 Verify the line current is equal to the vector sum of branch currents.
- 2.8 Sketch the vector diagram with the relevant data as obtained.

**3 Measure line and phase voltage & current in a 3-phase star connected inductive load.**

- 3.1 Sketch the circuit diagram for 3-phase star connected load.
- 3.2 Select equipment, tools & materials for the experiment.
- 3.3 Connect the circuit according to the circuit diagram
- 3.4 Check all connection points before connecting power supply.
- 3.5 Record the readings of instruments.
- 3.6 Compare the recorded values with calculated values.
- 3.7 Note down the observations remarks.

**4 Measure line and phase current & voltage in 3-phase delta connected inductive load.**

- 4.1 Sketch the circuit diagram for 3-phase delta connected load.
- 4.2 Select equipment, tools & materials for the experiment.
- 4.3 Connect the circuit according to the circuit diagram.
- 4.4 Check all connection points before connecting power supply.
- 4.5 Record the readings of the instruments.
- 4.6 Compare the recorded values with calculated values.
- 4.7 Note down the observations.

**5 Measure current, voltage and power in a balanced 3-phase star connected inductive load and construction of vector diagram.**

- 5.1 Sketch the circuit diagram for measuring power by 3 watt meters of a 3-phase system.
- 5.2 Select equipment, tools & materials for the experiment.
- 5.3 Connect the circuit according to the circuit diagram.
- 5.4 Check all connection points and equipment & instruments before actual operation.
- 5.5 Record the readings from the meters in the circuit.
- 5.6 Calculate the power from the formula  
 $P_t = W_1 + W_2 + W_3$  and  $3V_p I_p \cos \theta$
- 5.7 Draw the vector diagram using relevant data as obtained.
- 5.8 Note down the observations.

**6 Measure current, voltage and power in a balanced 3-phase delta connected inductive load and construction of vector diagram.**

- 6.1 Draw the circuit diagram for measuring power by 3-watt meter method of 3-phase delta connected load.
- 6.2 Select equipment, tools & materials for the experiment.
- 6.3 Connect the circuit according to the circuit diagram.
- 6.4 Check all connections, equipment and instruments before actual operation.
- 6.5 Record the reading from the meters used in the circuit.
- 6.6 Calculate the power from the formula  
 $P_t = W_1 + W_2 + W_3$  and  $P_t = \sqrt{3} V_{LL} I_{LI} \cos \theta$
- 6.7 Draw the vector diagram using obtained data.
- 6.8 Note down the observations.

**7 Find the transformation ratio of a transformer.**

- 7.1 Develop a circuit to perform the experiment.
- 7.2 Select required equipment and materials.
- 7.3 Connect the components according to the circuit diagram.
- 7.4 Check the connections.
- 7.5 Record the primary ( $E_p$ ) and secondary ( $E_s$ ) voltages.
- 7.6 Calculate the transformation ratio using the relation  $\frac{E_s}{E_p} = \frac{N_s}{N_p} = K$
- 7.7 Note down the observations.

**8 Construct load versus speed characteristic curve of DC shunt motor.**

- 8.1 Draw the required circuit diagram for the experiment.
- 8.2 Select the instrument and materials required.
- 8.3 Connect all the instruments according to diagram.
- 8.4 Take the necessary data from the connected instruments.
- 8.5 Draw the required curve.
- 8.6 Note down the observations.

**9 Study the components/parts of a 3-phase induction motor.**

- 9.1 Prepare a list of the parts of a 3-phase induction motor.
- 9.2 Dismantle the components/parts of the motor.
- 9.3 Develop sketches of each part.
- 9.4 Sketch the developed diagram of the windings of the motor.
- 9.5 Assemble the dismantled parts.
- 9.6 Note down the observations.

**10 Operate a 3-phase induction motor.**

- 10.1 Sketch the circuit diagram.
- 10.2 Select required, equipment, tools and materials.
- 10.3 Connect starter with motor.

10.4 Connect power supply to the circuit.

10.5 Observe the operation.

10.6 Measure the speed of the rotor.

10.7 Note down the observations.

**11 Start a 1-phase capacitor type motor/ceiling fan with regulator.**

11.1 Select the equipment and tools required for the experiment.

11.2 Sketch a working diagram.

11.3 Identify the two sets of coils.

11.4 Connect the capacitor with the proper set of coil.

11.5 Connect power supply to the fan motor.

11.6 Test the rotation of the motor opposite direction by changing the capacitor connection.

11.7 Note down the observations.

**REFERENCE BOOKS:**

- 1 DC Machines – Samadder & Gongopadhya
- 2 A course in Electrical Power - J. B. Gupta
- 3 A Text Book of Electrical Technology - B. L. Theraja
- 4 Automotive Electrical Equipment - H.W. Crouse, P.L. Kohli

**AIMS**

- To be able to understand the basic concepts of environment and environmental pollution.
- To be able to understand the concepts of ecology and ecosystems
- To be able to understand the basic concepts of environmental degradation relating to industrial production.
- To be able to understand the major environmental issues and problems.
- To be able to understand legislative measures to protect environment.

**SHORT DESCRIPTION**

Basic concepts of environment; natural resources; biogeochemical cycling; ecology and ecosystem; air; water; soil; solid waste management; development and environment; global environmental challenges; legislative protection of environment.

**DETAIL DESCRIPTION****1. Understand the multidisciplinary nature of environmental studies.**

- 1.1. Define environment, nature, pollution, pollutant, contaminant.
- 1.2. Describe the scope of environmental studies.
- 1.3. Describe the importance of environmental studies.
- 1.4. Describe the formation and structure of the Earth.
- 1.5. Describe the earth's natural system.
- 1.6. Describe the changing attitudes to the natural world.
- 1.7. Mention the main components of environment.
- 1.8. Define natural and man-made environment.
- 1.9. Distinguish between natural and man-made environment.

**2. Understand the natural resources.**

- 2.1. Define natural resources.
- 2.2. Classify natural resources.
- 2.3. Describe forest resources.
- 2.4. Describe water resources.
- 2.5. Describe mineral resources.
- 2.6. Describe food resources.
- 2.7. Describe energy resources.
- 2.8. Describe land resources.
- 2.9. Describe environmental problem relating to resources use.
- 2.10. Describe the role of an individual in conservation of natural resources.

**3. Understand the biogeochemical cycling.**

- 3.1. Define biogeochemical cycle.
- 3.2. Describe hydrologic cycle.
- 3.3. Describe carbon cycle.
- 3.4. Describe nitrogen cycle.
- 3.5. Describe oxygen cycle.
- 3.6. Describe phosphorus cycle.
- 3.7. Describe sulfur cycle.
- 3.8. Describe nutrient cycle.

#### **4. Understand the ecology and ecosystem.**

- 4.1. Define ecology and ecosystem.
- 4.2. Structure and function of an ecosystem.
- 4.3. Describe the components of ecosystem.
- 4.4. Explain the stability of ecosystem.
- 4.5. Describe ecological factors.
- 4.6. Describe interdependency between abiotic and biotic component.
- 4.7. Describe the meaning of following terms: species, population, community, ecological succession, community periodicity, climax community, ecological niche, habitat, plankton, nekton, ecological indicator, evolution, adaptation, producers, consumers, decomposers, food chains, food webs, ecological pyramids, bio-concentration, bio-magnification, biodiversity, threatened species, endanger species, extinct species, exotic species, biodiversity conservation and biogeography.
- 4.8. Describe energy flow in the ecosystem.
- 4.9. Describe the ecosystem of pond, ocean, estuary, grassland, cropland, forest, desert and mangrove.

#### **5. Understand the air as a component of environment.**

- 5.1. Define air.
- 5.2. Describe the composition of the clean dry atmospheric air at ground level.
- 5.3. Describe the atmospheric structure.
- 5.4. Define air pollution.
- 5.5. Describe major air pollutants and their impacts.
- 5.6. Describe the sources of air pollutants.
- 5.7. Explain the formation of photochemical smog and its effects.
- 5.8. Describe the effects of air pollution on vegetation, animal, human health and materials and resources.
- 5.9. Define sound and noise.
- 5.10. Describe the classification of sound.
- 5.11. Describe the effects of noise.

#### **6. Understand the water as a component of environment.**

- 6.1. Define water.
- 6.2. Describe the characteristics of water.
- 6.3. Describe the sources of water.
- 6.4. Describe the uses of water.
- 6.5. Explain that the water is a universal solvent.
- 6.6. Define water pollution, biological oxygen demand (BOD), effluent treatment plant (ETP).
- 6.7. Describe the sources of water pollution.
- 6.8. Describe the effects of water pollution.

#### **7. Understand the soil as a component of environment.**

- 7.1. Define soil.
- 7.2. Describe the constituents of soil.
- 7.3. Define soil pollution.
- 7.4. Describe causes soil degradation.
- 7.5. Describe the sources of soil pollution.
- 7.6. Describe the effects of soil pollution.

#### **8. Understand the concept of solid waste management.**

- 8.1. Define solid waste, refuse, garbage, rubbish, trashes, demolition and construction waste, e-waste, agricultural waste, pathological waste, radioactive waste, hazardous waste, 3R, 4R.
- 8.2. List the sources of solid waste.
- 8.3. Mention the classification of solid waste.
- 8.4. Mention the methods of collection of solid waste.
- 8.5. Describe the recycling of solid wastes.

- 8.6. Describe resource recovery from solid waste.
- 8.7. Describe the potential method of disposal of solid waste.
- 8.8. Describe control measures of urban and industrial wastes.

**9. Understand the development and environment.**

- 9.1. Define environmental ethics and environmental stress.
- 9.2. Describe environmental stress.
- 9.3. Define sustainable development.
- 9.4. Define urbanization.
- 9.5. Describe the causes of urbanization.
- 9.6. Describe the effects of urbanization on environment.
- 9.7. Define industrialization.
- 9.8. Describe the causes of industrialization.
- 9.9. Describe the effects of industrialization on environment.

**10. Understand the global environmental challenges.**

- 10.1. Define greenhouse gas and greenhouse effects.
- 10.2. Make a list of greenhouse gases and their contribution on greenhouse effects.
- 10.3. Describe the causes and consequences of greenhouse effects.
- 10.4. Describe acid rain.
- 10.5. Describe importance of ozone layer.
- 10.6. Define ozone depleting substances (ODS).
- 10.7. Describe ozone layer depletion mechanism.
- 10.8. Describe hazardous waste.
- 10.9. Describe chemicals pesticides.
- 10.10. Describe radioactive pollution.
- 10.11. Describe natural disaster.

**11. Understand the legislative protection of environment.**

- 11.1. Define environmental impact assessment (EIA) and environmental auditing (EA).
- 11.2. Mention environmental act and legislations prescribed for air, noise, water, soil and wild life protection.
- 11.3. Describe environmental conservation act 1995 in Bangladesh.
- 11.4. Describe the environment conservation rule 1997 in Bangladesh.
- 11.5. Describe the environmental framework in Bangladesh.
- 11.6. Describe The Montreal Protocol and The Kyoto Protocol.
- 11.7. Describe role of an individual in prevention of pollution.

**REFERENCES:**

1. Fundamentals of Environmental Studies, Mahua Basu and S. Xavier, Cambridge.
2. Ecology and Environment, P.D. Sharma, Rastogi Publications.
3. Basics of Environmental Science, Michael Allaby, Routledge.
4. Environmental Science, Jonathan Turk and Amos Turk, Saunders golden sunburst series.



**65841**

**Business Organization & Communication**

**T P C**

**2 0 2**

**AIMS:**

- To be able to understand the basic concepts and principles of business organization.
- To be able to understand the banking system.
- To be able to understand the trade system of Bangladesh.
- To be able to understand the basic concepts of communication and its types, methods.
- To be able to perform in writing, application for job, complain letter & tender notice.

**SHORT DESCRIPTION:**

Principles and objects of business organization; Formation of business organization; Banking system and its operation; Negotiable instrument; Home trade and foreign trade. Basic concepts of communication Communication model & feedback; Types of communication; Methods of communication; Formal & informal communication; Essentials of communication; Report writing; Office management; Communication through correspondence; Official and semi- official letters.

**DETAIL DESCRIPTION:**

**Theory:**

**1 Concept of Business organization.**

- 1.1 Define business.
- 1.2 Mention the objects of business.
- 1.3 Define business organization.
- 1.4 State the function of business organization.

**2 Formation of Business organization.**

- 2.1 Define sole proprietorship, partnership, Joint Stock Company. and co-operative
- 2.2 Describe the formation of sole proprietorship, partnership, joint stock Company, & co operative.
- 2.3 Mention the advantages and disadvantages of proprietorship, partnership and Joint Stock Company.
- 2.4 State the principles of Co operative & various types of Co operative.
- 2.5 Discuss the role of co-operative society in Bangladesh.

**3 Basic idea of Banking system and negotiable instrument.**

- 3.1 Define bank.
- 3.2 State the service rendered by bank.
- 3.3 Describe the classification of bank in Bangladesh.
- 3.4 State the functions of Bangladesh Bank in controlling money market.
- 3.5 State the functions of commercial Bank in Bangladesh
- 3.6 Mention different types of account operated in a bank.
- 3.7 Mention how different types of bank accounts are opened and operated.
- 3.8 Define negotiable instrument.
- 3.9 Discuss various types of negotiable instrument.
- 3.10 Describe different types of cheque.

#### **4 Home & foreign trade**

- 4.1 Define home trade.
- 4.2 Describe types of home trade.
- 4.3 Define foreign trade.
- 4.4 Mention the advantages and disadvantages of foreign trade.
- 4.5 Discuss the import procedure & exporting procedure.
- 4.6 Define letter of credit.
- 4.7 Discuss the importance of foreign trade in the economy of Bangladesh.

#### **5 Basic concepts of communication**

- 5.1 Define communication & business communication.
- 5.2 State the objectives of business communication.
- 5.3 Describe the scope of business communication.
- 5.4 Discuss the essential elements of communication process.

#### **6 Communication model and feedback.**

- 6.1 Define communication model.
- 6.2 State the business functions of communication model.
- 6.3 Define feedback.
- 6.4 State the basic principles of effective feedback.

#### **7 Types and Methods of communication.**

- 7.1 Explain the different types of communication;-
  - a) Two-way communication
  - b) Formal & informal communication
  - c) Oral & written communication
  - d) Horizontal & vertical communication
  - e) external & internal communication
  - f) Spoken & listening communication.
- 7.2 Define communication method.
- 7.3 Discuss the various methods of communication.
- 7.4 Distinguish between oral and written communication.

#### **8 Essentials of communication.**

- 8.1 Discuss the essential feature of good communication.
- 8.2 Describe the barriers of communication.
- 8.3 Discuss the means for overcoming barriers to good communication.

#### **9 Report writing.**

- 9.1 Define report, business report & technical report.
- 9.2 State the essential qualities of a good report.
- 9.3 Describe the factors to be considered while drafting a report.
- 9.4 Explain the components of a technical report.
- 9.5 Prepare & present a technical report.

#### **10 Office management.**

- 10.1 Define office and office work.
- 10.2 State the characteristics of office work.
- 10.3 Define filing and indexing.
- 10.4 Discuss the methods of filing.
- 10.5 Discuss the methods of indexing.
- 10.6 Distinguish between filing and indexing.

## 11 Official and semi-official letters.

11.1 State the types of correspondence.

11.2 State the different parts of a commercial letter.

11.3 Define official letter and semi-official letter.

11.4 Prepare & present the following letters: Interview letter, appointment letter, joining letter and application for recruitment. Complain letters, tender notice.

## REFERENCE BOOK:

1. উচ্চ মাধ্যমিক ব্যবসায়নীতি ও প্রয়োগ -মোহাম্মদ খালেকুজ্জামান
2. উচ্চ মাধ্যমিক ব্যাংকিং ও বীমা -প্রফেসর কাজী নুরুল ইসলাম ফারুকী
3. আধুনিক কারবার পদ্ধতি -লতিফুর রহমান
4. কারবার যোগাযোগ ও সচিবের কার্যপদ্ধতি -প্রফেসর লতিফুর রহমান ও প্রফেসর কাজী নুরুল ইসলাম ফারুকী
5. ব্যবসায়িক যোগাযোগ এবং অফিসের কর্মপ্রণালী -ড. এম, এ, মান্নান
6. ব্যবসায় যোগাযোগ - মোহাম্মদ খালেকুজ্জামান ও মোঃ মুশাররফ হোসেন চৌধুরী
7. Business organization & management- M.C. Shukla
8. Business organization & management- R.N. Gupta