



BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207.

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

ENVIRONMENTAL TECHNOLOGY
TECHNOLOGY CODE: **690**

2nd SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

ENVIRONMENTAL TECHNOLOGY (690)

2nd 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	69021	Water Quality Engineering	2	3	3	40	60	25	25	150
2	66422	Civil Engineering Drawing (CAD)	1	3	2	20	30	25	25	100
3	69022	Environmental Engineering Materials	2	3	3	40	60	25	25	150
4	65711	Bangla	3	3	4	60	90	50	0	200
5	65712	English	2	0	2	40	60		0	100
6	65921	Mathematics -2	3	3	4	60	90	50	0	200
7	65912	Physics-1	3	3	4	60	90	25	25	200
Total			16	18	22	320	480	200	100	1100

69021

WATER QUALITY ENGINEERING

T P C
2 3 3

AIMS

- To be able to understand the physical, chemical and biological composition of water.
- To be able to understand the water quality standard and regulations.
- To be able to perform the experiments related to water quality.

SHORT DESCRIPTION

Water characteristics and composition, water sampling techniques, physical water quality parameters, chemical water quality parameters, biological water quality parameters, water quality standard and requirements.

DETAIL DESCRIPTION

Theory:

1. General concept of water quality

- 1.1. Define water quality.
- 1.2. Mention the causes of water quality deterioration.
- 1.3. Define water scarcity with examples around the world.
- 1.4. Study the units of water quality parameters

2. Water sampling and quality assessment.

- 2.1. Describe physico-chemical and biological surveillance.
- 2.2. Mention the importance of water sampling.
- 2.3. Identify the location of sampling points
- 2.4. Determine sampling frequency
- 2.5. Describe sampling methods for microbiological analysis
- 2.6. State the storage techniques of sample for microbiological analysis
- 2.7. Describe sampling methods for physico-chemical analysis

3. Physical water quality parameter.

- 3.1. Make a list of physical water quality surveillance.
- 3.2. Define suspended solids.
- 3.3. Explain the sources and impact of suspended solids.
- 3.4. Define total suspended solid (TSS).
- 3.5. Describe the method of total suspended solid (TSS).
- 3.6. Identify the sources and impacts of turbidity.
- 3.7. Describe the method of turbidity measurement.
- 3.8. Describe the measurement method of color, taste, odor of water.

4. Chemical water quality parameters.

- 4.1. Define pH.
- 4.2. Measure the pH of water.
- 4.3. Define electrical conductivity (EC).
- 4.4. Describe the measuring technique of electrical conductivity (EC) of water.
- 4.5. Define total dissolved solids (TDS).
- 4.6. Describe the measuring procedure of total dissolved solids (TDS) in water.
- 4.7. Define hardness.
- 4.8. Mention the causes of hardness.
- 4.9. Describe the measurement method of hardness.

5. Ions presence in water.

- 5.1. Define ion.
- 5.2. Explain ion balance in water.
- 5.3. Define alkalinity, P-alkalinity, M-alkalinity, OH-alkalinity and total alkalinity of water.
- 5.4. Describe the measurement method of alkalinity and salinity.
- 5.5. Mention the sources and role of chloride and fluoride in - water.
- 5.6. Describe the measuring method of chloride and fluoride.
- 5.7. Describe the measuring method of free carbon di-oxide, carbonate, bi-carbonate, nitrate, phosphate, sulfate, ammonia present in water.
- 5.8. Describe the measuring method of silicate present in water.

6. Metals presence in water.

- 6.1. Identify the metals presence in water.
- 6.2. Explain the trace metal presence in water.
- 6.3. Describe the measurement method of calcium, magnesium, sodium, potassium, iron, manganese and zinc.
- 6.4. Describe the measurement method of arsenic, lead, mercury, cadmium, cyanide in water.

7. Biological water quality parameters.

- 7.1. Define biological monitoring.
- 7.2. List common water borne pathogens with their impacts.
- 7.3. Define indicator organism.
- 7.4. List common types of indicator organisms with their trait.
- 7.5. Describe the method of total coliform and fecal coliform.

8. Organics in water

- 8.1. Mention the biodegradable organics presence in water.
- 8.2. Define dissolved oxygen (DO).
- 8.3. Describe the method of measuring dissolved oxygen (DO) in water.
- 8.4. Define biochemical oxygen demand (BOD).
- 8.5. Describe the method of measuring biochemical oxygen demand (BOD).
- 8.6. Define chemical oxygen demand (COD).
- 8.7. Describe the method of measuring chemical oxygen demand (COD).
- 8.8. Define total organic carbon (TOC).
- 8.9. Describe the method of measuring total organic carbon (TOC).

9. Water quality requirement.

- 9.1. Define water quality standard.
- 9.2. List the average parameters of groundwater, lake or river water, sea water and rain water.
- 9.3. Describe the composition of water standard as per Bangladesh Standard Testing Institute (BSTI).
- 9.4. State the composition of water standard as per World Health Organization (WHO).
- 9.5. Describe wastewater/effluent water standard by Department of Environment (DoE).

Practical:

1. Determine temperature, color, odor, taste, turbidity of water sample.
2. Measure pH of water sample by web based sensor meter.
3. Measure As in water sample.
4. Measure the hardness of water sample.
5. Measure total suspended solids (TSS) present in water sample
6. Measure total dissolved solids (TDS) present in water sample.
7. Determine toxic metal (Pb, Cd, & Hg etc.) presents in water.
8. Determine nitrite (NO₂), nitrate (NO₃), and chloride (Cl) in water sample.
9. Determine the silica (SiO₂)
10. Measure dissolved oxygen (DO) present in water sample by web based sensor meter..
11. Measure biochemical oxygen demand (BOD) in wastewater.
12. Measure chemical oxygen demand (COD) in wastewater.
13. Determine total bacteria, total coliform and fecal coliform in water.

REFERENCE BOOKS

1. Peavy, Rewe and Tehobanoglous (1985), Environmental Engineering, Me Graw Hill Book Company, New York.
2. American Water Works Association, Water Quality and Treatment –A Hand book community water Suppliers, Edition.
3. Alley, E. Roberts, Water Quality Control Handbook
4. Robert, P.E. Reid, N. and Dekker, Marcel, Water Quality Systems, 2nd Edition, ISBN-0824740106
5. Zuane, John De, (1997), Handbook of Drinking Water Quality, Jhon Wiley and sons, ISBN-047128789

66422 CIVIL ENGINEERING DRAWING (CAD)

T	P	C
1	3	2

AIMS

- To prepare simple building drawing
- To assist to understand the code and symbols used in civil engineering drawing.
- To enable in learning detail drawing of building components.
- To enable to understand and perform computer aided design (AutoCAD).

SHORT DESCRIPTION

Drawing of single storied building, Code and symbols used in drawing, Detail drawing of floor, spread foundation, wall, pile, road, doors & windows, truss, Computer Aided Design (CAD) and plotting.

DETAIL DESCRIPTION

Theory:

DRAWING OF SINGLE STORID BUILDING WITH VERANDA

1 Understand the components of a single storied building.

- 1.1 Identify the name of different parts of building.
- 1.2 Define line plan of a building.
- 1.3 Describe the plan over plinth of simple building.
- 1.4 Explain the necessity of drawing, plan, elevation and section of building.

CODE AND SYMBOLS

2 Understand the use and necessity of code and symbols in drawing.

- 2.1 State the use of code and symbols in drawing.
- 2.2 Explain the necessity of covering for steel reinforcement according to code.
- 2.3 Describe the significance of minimum thickness of structural member according to code.
- 2.4 Explain the necessity of hooks, bend and lapping as per code.
- 2.5 Define construction joint and expansion joint as per code.

DETAIL DRAWING

3 Understand the significance of detail drawing.

- 3.1 Define the meaning of detail drawing.
- 3.2 Mention the necessity of detail drawing.
- 3.3 List different types of spread foundation.
- 3.4 List different types of RCC footing.
- 3.5 List different types of floors.

4 Understand the features of pile.

- 4.1 Define pile.
- 4.2 Mention the functions of pile cap.
- 4.3 List different types of piles used.
- 4.4 Explain the necessity of pile grouping.

5 Understand the features of road

- 5.1 List different types of road
- 5.2 List different types of joints in rigid pavement
- 5.3 State the meaning of right of way.
- 5.4 Identify different components of a rigid pavement.
- 5.5 Identify different components of a flexible road.

6 Understand the features of doors and windows.

- 6.1 List different types of door
- 6.2 Label different parts of a door.
- 6.3 List different types of window.
- 6.4 Label different parts of a window.

- 7 Understand the features of trusses.**
- 7.1 Define truss.
 - 7.2 Label different parts of a wooden truss.
 - 7.3 Label different parts of a steel truss.
 - 7.4 Distinguish between king post and queen post truss.

COMPUTER AIDED DESIGN (CAD)

- 8 Understand the functions and uses of different CAD commands.**
- 8.1 Define AutoCAD.
 - 8.2 State how to start and exit AutoCAD.
 - 8.3 Name different tools used in AutoCAD.
 - 8.4 Explain the necessity of editing drawing.
 - 8.5 State the necessity of drawing units and limits.
 - 8.6 Mention the functions of the following editing commands:
COPY, MOVE, ARRAY, OFFSET, TRIM, FILLET, CHAMFER, EXTEND, BREAK, ROTATE, STRETCH, MIRROR, CHANGE, SCALE, AND PEDIT.
 - 8.7 State how to draw the following draw commands:
LINE, TRIANGLE, RECTANGLE, POLYGON, CIRCLE, ARCH.
 - 8.8 Mention the functions of the following commands:
ZOOM, PAN, UNDO, REDO, SAVE.
 - 8.9 Mention the functions of the following dimension commands:
DIMENSION STYLE, LINEAR DIMENSION, ALIGNED DIMENSION.
 - 8.10 State the INSERTION OF TEXT drawing using AutoCAD.
 - 8.11 Mention the functions of HATCH in drawing using AutoCAD.
 - 8.12 Mention the advantages of LAYERS in drawing using AutoCAD.
 - 8.13 Mention the functions of the following plotting commands:
LAYOUT, VIEW PORT, MODEL SPACE, PAPER, SPACE.

Practical:

DRAWING OF SINGLE STORIED BUILDING WITH VERANDAH

- 1 Prepare drawing of a single storied building.**
- 1.1 Draw the line plan of a single storied simple building with verandah.
 - 1.2 Draw plan over plinth of simple building with verandah from the line plan as started in 1.1.
 - 1.3 Draw front and side elevation of the simple building started in 1.2
 - 1.4 Draw the cross section of simple building as started in 1.2
 - 1.5 Assemble plan over plinth, sections and elevations of simple building with proper dimensions, heading and title block in proper places on one sheet according to given data.
 - 1.6 Draw the isometric view of a given single roomed building showing front and one side elevation.

CODE AND SYMBOLS

- 2 Apply different types of code in civil engineering drawing.**
- 2.1 Use the different types of design code.
 - 2.2 Use clear cover for protection of reinforcing steel according to code.
 - 2.3 Use anchorage of reinforcing steel according to code.
 - 2.4 Use minimum thickness of structural members according to code.
 - 2.5 Use minimum width of beam according to code.
 - 2.6 Use minimum requirement of reinforcement according to code.
- 3 Apply different symbols in civil engineering drawing.**
- 3.1 Draw the standard hooks and bends according to code.
 - 3.2 Draw the compression joints in reinforcing steel.
 - 3.3 Draw the tensile joints in reinforcing steel.
 - 3.4 Prepare a bar-schedule with specification of reinforcing steel.
 - 3.5 Draw the construction, expansion & contraction joints.

DETAIL DRAWING

4 Construct the drawing of floor.

- 4.1 Draw timber floor.
- 4.2 Draw typical cement concrete (CC) floor over single brick flat soling.
- 4.3 Draw the typical reinforced cement concrete (RCC) floor.

5 Prepare detail drawing of brick spread foundation and RCC footing.

- 5.1 Draw the brick spread foundation for eccentric loading.
- 5.2 Draw the brick spread foundation for soft soil.
- 5.3 Draw the brick spread foundation on slopped ground.
- 5.4 Draw the brick wall with RCC footing.
- 5.5 Draw the RCC inverted T-beam footing.
- 5.6 Draw the RCC cantilever footing.

6 Prepare the detail drawing of pile and pile cap.

- 6.1 Draw the detail drawing of RCC cast-in-situ piles.
- 6.2 Draw sections of a square pre-cast RCC pile.
- 6.3 Draw the cross-section of a pile cap over a group of piles.
- 6.4 Draw the shoe of a pile.

7 Prepare the detail drawing of road.

- 7.1 Draw the right of way of a national highway in the embankment.
- 7.2 Draw the cross-section of bituminous road on embankment showing foundation details.
- 7.3 Draw the cross-section of rigid pavement on embankment showing foundation details.

8 Prepare detail drawing of doors and windows (wooden/steel/aluminum).

- 8.1 Draw the elevation of a paneled door.
- 8.2 Draw horizontal section of paneled door cutting plane passing through panels.
- 8.3 Draw vertical section of paneled door cutting plane passing through panels.
- 8.4 Draw the horizontal cross-section and elevation of metal window.
- 8.5 Draw the horizontal and vertical section of a fully glazed window.

9 Prepare detail (working) drawing of wooden truss.

- 9.1 Draw elevation of king post/queen post roof truss on 25cm thick brick wall.
- 9.2 Make detail (working) drawing of heel joint of wooden truss.
- 9.3 Make detail (working) drawing of ridge of wooden truss.
- 9.4 Make detail (working) drawing of joint (intermediate point) of beam in wooden truss.

10 Prepare working drawing of steel truss.

- 10.1 Draw elevation of steel truss (Pratt truss/warren truss) rests on 25cm x25cm RCC Column.
- 10.2 Make detail drawing of heel joint of steel truss rests on RCC column.
- 10.3 Make detail drawing of ridge joint of steel truss.
- 10.4 Make detail drawing of joint on the rafter of steel truss.
- 10.5 Make detail drawing of joint on the tie beam of steel truss.

COMPUTER AIDED DESIGN (CAD)

11 Prepare geometrical drawing using AutoCAD.

- 11.1 Introduction to CAD Software, Co-ordinate system.
- 11.2 Open an Auto CAD drawing file
- 11.3 Set up the units, display formats and precision of measurements.
- 11.4 Set up the drawing limits.
- 11.5 Make a grid of dots similar to graph paper.

12 Draw and save drawing using AutoCAD.

- 12.1 Draw a line using Auto CAD.
- 12.2 Draw triangles using Auto CAD.
- 12.3 Draw different types of rectangles using Auto CAD.
- 12.4 Draw different types of polygons using Auto CAD.
- 12.5 Draw circles, arcs, ellipse using Auto CAD.
- 12.6 Save the existing drawing using AutoCAD.

- 13 Edit the existing drawing using AutoCAD.**
- 13.1 Erase a line using commands.
 - 13.2 Un erases an erased line using undo and redo commands.
 - 13.3 Magnify a portion of the drawing to look closely.
 - 13.4 Regenerate the whole drawing.
 - 13.5 Trim and Extend a portion of a line, area, curve or any object.
 - 13.6 Move and Copy a drawing from one place to another.
 - 13.7 Use commands to fill plotted lines, area and circle.
 - 13.8 Use of commands like CHAMFER, FILLET, DONUT, MIRROR.
 - 13.9 Use of commands like UNITS, UCS, LIMITS, SNAP
 - 13.10 Perform the uses of the following commands:
ARRAY, OFFSET, BREAK, ROTATE, STRECH, MIRROR, SCALE, PEDIT, EXPLODE,
BLOCK, INSERT
- 14 Dimension a drawing using AutoCAD.**
- 14.1 Select a drawing file for dimensioning.
 - 14.2 Use commands to add linear dimensions in the drawing.
 - 14.3 Use commands to add angular dimensions in the drawing.
 - 14.4 Use commands to modify dimension style in the drawing.
- 15 Layers and hatches the drawing using AutoCAD.**
- 15.1 Create different layers for line, dimension, text, hatches, etc.
 - 15.2 Select different color for different layer.
 - 15.3 Select the type and scale of the hatch for a drawing.
 - 15.4 Select the type and size of the text for a drawing.
 - 15.5 Insert text in the drawing.
 - 15.6 Perform the uses of the following plotting commands:
layout, view port, model space, paper space.
- 16 Use text and plotting using AutoCAD.**
- 16.1 Select the type and size of the text for a drawing.
 - 16.2 Insert text in the drawing.
 - 16.3 Perform the uses of the following plotting commands:
LAYOUT, VIEW PORT, MODEL SPACE, PAPER SPACE.
 - 16.4 Plot the drawing.
 - 16.5 Plot each layer of the drawing separately.
- 17 Prepare the drawing of plan, elevation and section of a single storied building.**
- 17.1 Compose the data of plan for a single storied building using AutoCAD.
 - 17.2 Draw a plan of a single storied building using AutoCAD.
 - 17.3 Compose the data of elevation for a single storied building using AutoCAD.
 - 17.4 Draw the elevation of a single storied building using AutoCAD.
 - 17.5 Compose the data of section of a single storied building using AutoCAD.
 - 17.6 Draw the section of a single storied building using AutoCAD.

REFERENCE BOOKS

- | | |
|----------------------------------|------------------------------|
| 1. Structural Detailing | - Peter H Newton |
| 2. Civil Engg. Drawing | - Guru Charan Singh |
| 3. AutoCAD | - Engr. Md. Shah Alam |
| 4. Mastering AutoCAD 2008 | - Engr. Samuel Mallik |
| 5. Mastering AutoCAD | - George Omura |

AIMS

- To be able to identify and classify the materials used for environmental engineering fields.
- To be able to understand the characteristics of various engineering materials.
- To be able to understand the uses of different engineering materials.

SHORT DESCRIPTION

Aspects of engineering materials; Engineering uses of ferrous metals and alloys; Insulating materials; Sound absorbing materials; Fire and water proofing materials; Fuels and lubricants; Plastic materials, Water and air purification materials.

DETAIL DESCRIPTION**Theory:****1. Various aspects of engineering materials.**

- 1.1. Define engineering materials.
- 1.2. Mention the classification of engineering materials in environmental technology.
- 1.3. Mention the general properties of engineering materials.
- 1.4. Identify the importance of engineering materials in Environmental Technology.

2. Basic concept of rocks.

- 2.1. Define rock.
- 2.2. Identify the classification and composition of rock.
- 2.3. Explain the rock cycle.
- 2.4. Describe the formation of rocks.

3. Basic concept of minerals.

- 3.1. Define mineral.
- 3.2. State the properties of minerals.
- 3.3. Identify the classification and composition of minerals.
- 3.4. Mention the growth of minerals.
- 3.5. Describe the identification techniques of minerals.

4. Application of bricks, sands and cement in construction works.

- 4.1. Define brick.
- 4.2. Mention different constituents for manufacturing of good bricks.
- 4.3. Classify sand according to their sources.
- 4.4. Mention the specifications of good sand.
- 4.5. State the use of various grades of sand.
- 4.6. Define cement.
- 4.7. Describe the functions of various ingredients of cement.
- 4.8. Mention the uses of cement as engineering material.

5. Engineering uses of alloys.

- 5.1. Define alloy.
- 5.2. Classify metal alloys with example.
- 5.3. Mention the classification of steel on the basis of carbon content.
- 5.4. Describe the fabrication of metals.
- 5.5. Mention the uses of various alloy steels.
- 5.6. Classify synthetic materials.
- 5.7. Mention the uses of various synthetic materials.
- 5.8. Describe the factors affecting materials properties

6. Uses of polymers and plastics.

- 6.1. Define polymer.
- 6.2. Describe the structure of polymers.
- 6.3. Mention the general properties of polymeric materials.
- 6.4. Classify polymers.
- 6.5. Describe advantages and disadvantages of plastics.
- 6.6. Identify the uses of fiber.
- 6.7. Define plastic.
- 6.8. List the names of raw materials for plastic.
- 6.9. Explain the properties of plastic.
- 6.10 Identify the types and uses of plastic as engineering materials.

7. Application of various heat and sound insulating materials.

- 7.1. Mention the functions of insulating materials.
- 7.2. List heat insulating materials and their application.
- 7.3. Mention the names of synthetic insulating materials.
- 7.4. Describe the uses of asbestos as insulating material.
- 7.5. Mention the names of sound absorbing materials and their uses.
- 7.6. Explain light weight concrete used in acoustic works.

8. Fundamental aspects of fire and water proofing materials.

- 8.1. Mention the term of fire proofing materials and water proofing materials.
- 8.2. List fire resistance materials and their uses.
- 8.3. List water proofing materials and their uses.
- 8.4. Explain the uses of asbestos as fire and waterproof materials.
- 8.5. List the characteristics of refractory materials.

9. Basic concepts of fuels and lubricants.

- 9.1. Define the term fuel and lubricants.
- 9.2. Mention the main purposes of fuels with their classifications.
- 9.3. List the fuel contaminants and their sources.
- 9.4. Describe the pollution process of fuel burning.
- 9.5. List different types of lubricants.
- 9.6. Explain the characteristics of lubricating oils.

10. Water and air purification materials.

- 10.1 Define Absorbent and Adsorbent.
- 10.2 Mention the types of absorbent and adsorbent.
- 10.3 Explain the characteristics of good absorbent and adsorbent.
- 10.4 Define following terms: Lime, Activated alumina, Activated carbon, Alum, Bleaching powder, CIM, Resin, Silica gel, Soda-ash, Zeolite.
- 10.5 Mention the Constituents of charcoal and Classification of charcoal.
- 10.6 Mention the types of Resin.
- 10.7 Mention the classification of Zeolite.
- 10.8 Describe arsenic removal materials.
- 10.9 Describe air pollutant removal materials.

Practical:

1. Show skill in identifying various types of rock

- 1.1. Selected different type of rock in the laboratory.
- 1.2. Sketch different type of rock on the basis of formation.

2.Show skill in field test of bricks

2.1. Perform field test of bricks

2.2. Select 1st class, 2nd class, 3rd class bricks and jhama bricks

3.Show skill in conducting laboratory test of bricks

3.1. Perform:

(a) Compression test

(b) Absorption test

3.2. Determine average weight of a brick.

4.Show skill in conducting laboratory test of cement

4.1. Conduct laboratory tests of cement

(a) Make cement paste of Normal Consistency (CPNC)

(b) Determine initial setting time

(c) Perform final setting time

(d) Perform compressive strength test

(e) Perform tensile strength test

(f) Perform fineness test

4.2. Conduct field tests of cement

5.Show skill in conducting tests of coarse aggregate

(a) Specific gravity of sand

(b) Grading of aggregates

6.Show skill in conducting test of sand

(a) Bulking of sand

(b) F M of sand

(c) Specific gravity of sand

7. Show skill in identifying various ferrous and nonferrous metals

7.1. Identify mild steel, cast iron, copper, and aluminum, tin by physical observation.

8.Show skill in identifying various type of Lime, Activated alumina, Alum, Resin, Bleaching powder, CIM, Zeolite.

9.Show skill in identifying various types of water and air purification materials.

REFERENCE BOOKS

1. A text book on Engineering Materials –G. J. Kulkarni
2. Engineering Materials –M. A. Aziz
3. Water Supply & Sanitation- M. Feroze Ahemed, Md. Mujibur Rahman

উদ্দেশ্য :

১. মাতৃভাষা হিসেবে বাংলা ভাষার প্রকৃতি ও বৈশিষ্ট্য সম্পর্কে ধারণা লাভ। ভাষার ব্যবহারে প্রায়োগিক যোগ্যতা অর্জন।
২. বাংলা সাহিত্য পঠন-পাঠনের মাধ্যমে জাতীয় চেতনা, দেশপ্রেম, মুক্তিযুদ্ধের চেতনা, শুদ্ধাচার, নীতি ও মূল্যবোধের উন্মেষ ঘটানো।

সংক্ষিপ্ত বিবরণী :

মাতৃভাষা ও সৃজনশীলতা : বাংলা ভাষা রীতির বিচিত্রতা, বানান রীতি, পত্র রচনা এবং কবিতা, প্রবন্ধ, নাটক, উপন্যাস ও ছোট গল্প।
বিশদ বিবরণী:

১. বাংলা ভাষার প্রয়োগ:

ক) বাংলা ভাষা :

ভাষার সংজ্ঞা, বাংলা ভাষা রীতি - সাধু, চলিত, আঞ্চলিক বা উপভাষা (সংজ্ঞা, বৈশিষ্ট্য, পার্থক্য ও উদাহরণ)

খ) বাংলা বানান রীতি ও শব্দ প্রয়োগ:

১. বাংলা একডেমির প্রমিত বানান রীতি, ণ-ত্ব ও ষ-ত্ব বিধি

২. শব্দ ও শব্দের শ্রেণি বিভাগ (সংজ্ঞা, শব্দের গঠন, উৎস বা উৎপত্তি ও অর্থগত)

৩. বাক্য প্রকরণ ও গঠন রীতি (সংজ্ঞা, বাক্য গঠন এবং প্রকার)

গ) পত্র রচনা :

আবেদন পত্র (চাকুরি, ছুটি), চাকুরিতে যোগদান পত্র, মানপত্র, স্মারকলিপি, সংবাদপত্রে প্রকাশের জন্য পত্র

২. বাংলা সাহিত্য:

ক. কবিতা :

১. বঙ্গভাষা -মাইকেল মধুসূদন দত্ত

২. সোনার তরী - রবীন্দ্র নাথ ঠাকুর

৩. উমর ফারুক - কাজী নজরুল ইসলাম

৪. বাংলার মুখ আমি- জীবনানন্দ দাশ

৫. আসাদের শার্ট - শামসুর রাহমান

৬. স্বাধীনতা শব্দটি কি করে আমাদের হলো? - নির্মলেন্দু গুণ

খ. প্রবন্ধ :

১. অর্ধাসী -রোকেয়া সাখাওয়াত হোসেন

২. বইকেনা - সৈয়দ মুজতবা আলী

গ. একাঙ্কিকা (নাটিকা): মানুষ -মুনীর চৌধুরী

ঘ. উপন্যাস: লালসালু - সৈয়দ ওয়ালী উল্লাহ

ঙ. ছোট গল্প:

১. হৈমন্তী - রবীন্দ্র নাথ ঠাকুর

২. একুশের গল্প - জহির রায়হান

৩. পাতালেহাসপাতালে - হাসান আজিজুল হক

ব্যবহারিক**১. নির্ধারিত বক্তৃতা :**

বাংলাদেশ ও বাঙালি সংস্কৃতি, বিভিন্ন জাতীয় দিবস (একুশে ফেব্রুয়ারি ও আন্তর্জাতিক মাতৃভাষা দিবস, স্বাধীনতা দিবস, বিজয় দিবস, জাতীয় শোক দিবস, মুজিব নগর দিবস, মহান মে দিবস)

প্রাতিষ্ঠানিক বক্তৃতা- নবাগত শিক্ষক/ছাত্রছাত্রীদের বরণ, গুরুত্বপূর্ণ ব্যক্তিবর্গের আগমন উপলক্ষে বক্তৃতা।

২. উপস্থিত বক্তৃতা :

বিষয়বস্তু উন্মুক্ত

৩. আবৃত্তি :

১. মানুষ - কাজী নজরুল ইসলাম
২. আকাশ নীলা - জীবনানন্দ দাশ
৩. পল্লী জননী - জসীম উদ্দীন
৪. ছাড়পত্র - সুকান্ত ভট্টাচার্য
৫. তোমাকে পাওয়ার জন্য হে স্বাধীনতা - শামসুর রাহমান
৬. নিষিদ্ধ সম্পাদকীয় - হেলাল হাফিজ

৪. বিতর্ক (নমুনা)

সংস্কৃতিই আধুনিক মানুষের ধর্ম

তথ্য প্রযুক্তির অবাধ ব্যবহারই যুব সমাজের অবক্ষয়ের মূল কারণ

গতানুগতিক শিক্ষা নয় কর্মমুখি শিক্ষাই অর্থনৈতিক মুক্তির চাবিকাঠি

চালকের অসাবধানতাই সড়ক দুর্ঘটনার প্রধান কারণ

মুক্তিযুদ্ধের চেতনাই অসাম্প্রদায়িক বাংলাদেশ প্রতিষ্ঠার মূলমন্ত্র

প্রযুক্তির বিকাশই প্রকৃতি বিনাশের একমাত্র কারণ

৫. প্রতিবেদন প্রণয়ন ও উপস্থাপন:

স্থানীয় বিভিন্ন সমস্যা ও অনুসন্ধানী যে কোন বিষয়।

Objectives:

After The Completion of the Course, Learners Will Be Able To Develop-

- Reading, Listening With Understanding
- The Fluency Of Speech
- Grammatical Accuracy With Emphasis On Spelling & Punctuation
- Creative Writing

Seen Comprehension: (Marks-20)

Unit	Lesson	Title
People Or Institutions Making History (Unit One)	1	Nelson Mandela ,From Apartheid Fighter To President
	2	The Unforgettable History
Food Adulteration(Unit Three)	1	Food Adulteration Reaches Height
	2	Eating Habit And Hazards
Human Relationship(Unit Four)	2	Love And Friendship
Environment And Nature (Unit Eight)	1	Water ,Water Everywhere
	5	Kuakata: Daughter Of The Sea
Greatest Scientific Achievement (Unit Thirteen)	1	Some Of The Greatest Scientific Achievements Of The Last 50 Years
	2	Science And Technology Against An Age- Old Disease
Art And Music (Unit Fourteen)	1	What Is Beauty?
	3	Crafts In Our Time
Tours And Travels (Unit Fifteen)	1	Travelling To A Village In Bangladesh
	4	The Wonders of Vilayet

N.B: The Unit Mentioned Refers To The Text Book (1st Paper) English For Today For Class 11- 12
By National Curriculum & Text Book Board, Dhaka.

Grammar (Marks-20)**1. (A) Uses of Articles.**

(B) Uses of Tense *(Right Forms Of Verbs with Indicators)

(C) Classify Verbs: (Regular and Irregular Verbs, Auxiliary, Principal, Finite, Non-Finite Verbs,)

2. Sentence:

(A) Changing Sentences: (Assertive, Interrogative, Optative, Imperative, Exclamatory Simple, Complex and Compound), Comparison of Adjectives/Adverbs

(B) Question Making: WH, Yes/No, Tag Question

3. Enrich Vocabulary: Synonyms, Antonyms; Suffix And Prefix.

4. Voice, Narration

5. Sentence Analysis:

Study of Part of Speech, (Type Of Verbs-Regular and Irregular Verbs, Auxiliary and Principal Verb)
Study of Phrases and Clauses (Noun/ Adjective/ Verb/ Participle /Adverbial/ Prepositional Phrases and Principal /Sub Ordinate /Co Ordinate Clauses)

Free Writing (Marks -20)

1. Write Dialogues: (With Teacher, Principal, Shopkeeper, Hotel Manager, Station Master, Newcomer, Buyers, Doctor, Friend, Colleagues Etc).
2. Report Writing On Different Events/ Occasions/ Accidents.
3. Writing Situational Personal and Official Letters.
4. Writing Job Application with CV /Appointment Letter / Joining Letter
5. Write A Guided Paragraph With Questions.

OBJECTIVES

- To enable in solving the simultaneous equations with the help of determinant and matrix.
- To make understand the exponential series.
- 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

Algebra : Determinants, Matrix, Exponential Series.

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

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**ALGEBRA :****1 Apply determinants to solve simultaneous equations.**

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

2 Apply the concept of matrix.

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

3 Understand exponential series.

- 3.1 Define e.
- 3.2 Prove that e is finite and lies between 2 and 3.
- 3.3 Prove that $e^x = 1 + \frac{x}{L^1} + \frac{x^2}{L^2} + \frac{x^3}{L^3} + \frac{x^4}{L^4} + \dots$ to ∞
- 3.4 Solve problems of the followings types :
 - i) $1 + \frac{1}{L^2} + \frac{1}{L^4} + \frac{1}{L^6} + \dots$ to ∞
 - ii) $\frac{1}{L^2} + \frac{1+2}{L^3} + \frac{1+2+3}{L^4} + \frac{1+2+3+4}{L^5} + \dots$ to ∞

TRIGONOMETRY

4 Apply the concept of inverse circular function.

- 4.1 Explain the term inverse circular function and principal value of a trigonometrical ratio.
4.2 Deduce mathematically the fundamental relations of different circular functions.
4.3 Convert a given inverse circular function in terms of other functions.
4.4 Prove mathematically

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

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

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

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

- 4.5 Solve problems of the following types.

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

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

- c) Prove that the area of the segment cut from a circle of radius r by a chord at a distance d from the centre is given by

$$K = r^2 \cos^{-1} \frac{d}{r} - d\sqrt{r^2 - d^2}$$

5 Apply the principle of properties of triangles.

- 5.1 Prove the followings identities :

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

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

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

v) $\Delta = \frac{1}{2} bc \sin A$.

- 5.2 Establish the followings.

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

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

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

- 5.3 Solve the problems of the following types:

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

- ii) An object experiences two forces F_1 and F_2 of magnitude 9 and 13 Newtons with an angle 100° between their directions. Find the magnitude of the resultant R .

DIFFERENTIAL CALCULUS

6 Understand the concept of functions.

- 6.1 Define constant, variable, function, domain, range
6.2 Solve problems related to functions.

7 Understand the concept of limits.

- 7.1 Define limit and continuity of a function.
7.2 Distinguish between $\lim_{x \rightarrow a} f(x)$ and $f(a)$.

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

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

8 Understand differential co-efficient and differentiation.

8.1 Define differential co-efficient in the form of

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

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

9 Apply the concept of differentiation.

9.1 State the formulae for differentiation:

- (i) sum or difference
- (ii) product
- (iii) quotient
- (iv) function of function
- (v) logarithmic function

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

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

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

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

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

10.3 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 ?

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

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

11.2 Express Leibnitz's theorem

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

12 Understand partial differentiation.

12.1 Define partial derivatives.

12.2 State formula for total differential.

12.3 State formulae for partial differentiation of implicit function and homogenous function.

12.4 State Euler's theorem on homogeneous function.

12.5 Solve the problems of partial derivatives.

INTEGRAL CALCULUS

13 Apply fundamental indefinite integrals in solving problems.

13.1 Explain the concept of integration and constant of integration.

13.2 State fundamental and standard integrals.

13.3 Write down formulae for:

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

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

13.5 Solve problems of indefinite integration.

14 Apply the concept of definite integrals.

14.1 Explain definite integration.

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

14.3 Solve problems of the following types:

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

SL No	Athour	Reference Title	Publication
01	S. P Deshpande	Mathematics for Polytechnic Students	Pune Vidyarthi Graha Prakashan
02	H. K. Das	Mathematics for Polytechnic Students(Volume I)	S.Chand Prakashan
03	Shri Shantinakaran	Engg.Maths Vol I & II	S.Chand & Comp
04	Dr. B M Ekramul Haque	Higher Mathematics	Akshar Patra Prakashani
05	Md. Abu Yousuf	Differential & Integral Calculus	Mamun Brothers

65912

PHYSICS-1

T P C
3 3 4

OBJECTIVES

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

SHORT DESCRIPTION

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

DETAIL DESCRIPTION

THEORY :

1. PHYSICAL WORLD AND MEASUREMENT

- 1.1. Nature of Physical World.
- 1.2. Scope and Excitement of Physics.
- 1.3. Few Terms about Physics.
- 1.4. Physics and other world of Technological Knowledge.
- 1.5. Principle of Measurement.
- 1.6. Fundamental and Derived Quantities and Units.
- 1.7. Dimensions of Units.
- 1.8. Errors in Measurement.

2. SCALAR AND VECTOR QUANTITIES

- 2.1 Define vector and scalar quantities with examples.
- 2.2 Show the various representations of the vector quantities; and representation of a vector by unit vector.
- 2.3 Find and explain the resultant of two vectors in different directions.
- 2.4 Resolve a vector into horizontal & vertical component.
- 2.5 Explain the dot and cross product of two vectors.
- 2.6 Define laws of triangle of vector.

3. MOTION AND EQUATIONS OF MOTION

- 3.1 Define rest and motion
- 3.2 Classify and explain of motion.
- 3.3 Define and explain displacement, speed, velocity, acceleration and retardation.
- 3.4 Deduce the relationship between displacement, velocity, acceleration and retardation from these definitions.
- 3.5 Motion of a Projectile.
- 3.6 Equation of motion of a freely moving body thrown obliquely vertically upward or motion of a projectile.
- 3.7 Define angular velocity and linear velocity with their units.
- 3.8 Deduce the relation between angular velocity and linear velocity.
- 3.9 Define centripetal and centrifugal force with examples.
- 3.10 Prove that centrifugal force = $\frac{mv^2}{r}$
- 3.11 State and explain the laws of falling bodies and mention the equation of motion of a body when it is projected vertically upwards or downwards.

4. NEWTON'S LAWS OF MOTION FORCE AND FRICTION

- 4.1 Define force.
- 4.2 State Newton's laws of motion.
- 4.3 Define different units of force and their correlation and also mention the dimension of force.
- 4.4 Prove $P=mf$, from Newton's 2nd law of motion.
- 4.5 Find out the resultant of parallel forces.
- 4.6 Define inertia and momentum
- 4.7 State and prove the principles of conservation of momentum.
- 4.8 Define friction and describe the different kinds of friction.
- 4.9 Define the co-efficient of static friction.
- 4.10 Show that the co-efficient of static friction is equal to the tangent of angle of repose
- 4.11 State the merits and demerits of friction.

5. GRAVITY AND GRAVITATION

- 5.1 Define and explain the Kepler's Law.
- 5.2 Define gravity and gravitation.
- 5.3 Define and determine the gravitational constant (G) and also mention its units and dimension.
- 5.4 Define acceleration due to gravity 'g' and also mention its units and dimension.
- 5.5 Discuss the variation of 'g' at different places.
- 5.6 Define mass and weight with their units and dimension.
- 5.7 Distinguish between mass and weight.
- 5.8 Define and explain gravitational potential and escape velocity

6. SIMPLE HARMONIC MOTION (SHM)

- 6.1 Define Periodic and simple harmonic motion (SHM).
- 6.2 State the characteristics of SHM.
- 6.3 Describe a simple pendulum and a second pendulum.
- 6.4 Define effective length, amplitude, phase, complete oscillation, period of oscillation, frequency.
- 6.5 State and explain the laws of simple pendulum.
- 6.6 Motion of simple pendulum and its time period.

7. WORK, POWER AND ENERGY

- 7.1 Define work, power and energy.
- 7.2 State the units and dimensions of work, power and energy.
- 7.3 State and prove the principle of the conservation of energy.
- 7.4 Define potential energy (PE) and kinetic energy (KE).
- 7.5 Derive the equation of potential and kinetic energy.
- 7.6 Recognize that the useful work can be found from:

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

8. ELASTICITY

- 8.1 Name some of the general and special properties of matter.
- 8.2 Define Elasticity and Elastic limit.
- 8.3 Define perfectly elastic body and perfectly rigid body.
- 8.4 Define stress and strain with their units and dimensions.
- 8.5 State and explain the Hook's law.
- 8.6 Describe various kinds of modulus of elasticity.
- 8.7 Mention the units and dimensions of modulus of elasticity.
- 8.8 Define and explain Poisson's ratio.

9. HYDROSTATICS

- 9.1 Define pressure as force per unit area and state that it is measured in N/m^2 or Pascal.
- 9.2 State characteristics of liquid pressure.
- 9.3 Establish the pressure at a point in a fluid depend upon the density of the fluid, the depth in the fluid and acceleration due to gravity.
- 9.4 Surface tension and surface energy, Angle of contact.
- 9.5 Capillarity and theory of capillarity.
- 9.6 Viscosity and co-efficient of viscosity.
- 9.8 Necessity of viscosity.

10. WAVE AND SOUND

- 10.1 Wave and wave motion.
- 10.2 Transverse wave and longitudinal wave.
- 10.3 Some definitions relating waves.
- 10.4 Progressive wave and stationary waves.
- 10.5 Equation of progressive wave.
- 10.6 Sound and production of sound.
- 10.7 Sound is a longitudinal traveling wave.
- 10.8 Interference of sound: Constructive and Destructive interference.
- 10.9 Define beats and Mechanism of formation of beats.

11. SOUND AND VELOCITY OF SOUND

- 11.1 Identify that sound is produced by vibration and travels through a medium as a longitudinal wave.
- 11.2 Recognize that sound can be produced of different pitches (frequencies) & that the human ear has an audible frequency range covering approximately 20 Hz to 20 KHz.
- 11.3 State the approximate frequency range for
 - a. infrasonic sound,
 - b. Ultrasonic (supersonic) sound.
- 11.4 Explain how sound is absorbed, reflected & refracted by different types of surface.
- 11.5 Describe the practical uses of echo sounding devices.
- 11.6 Define velocity of sound.
- 11.7 State the velocity of sound at NTP in still air.
- 11.8 Compare the effects of pressure, temperature & humidity on the velocity of sound in air.

PRACTICAL

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

REFERENCE BOOKS:

- 1. Higher Secondary Physics - First Part - by Dr. Shahjahan Tapan
- 2. A Text Book of Properties of of matter -By N Subrahmanyam and Brij Lal
- 3. A Text Book of Sound -By N Subrahmanyam and Brij Lal
- 4. Higher Secondary Physics- First Part -by Prof. Golam Hossain Pramanik
- 5. Higher Secondary Physics- First Part -by Ishak Nurfugnabi