BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207.

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

CIVIL TECHNOLOGY

TECHNOLOGY CODE: **664**

4th SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

CIVIL TECHNOLOGY (664)

4th 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	66441	Structural Mechanics	2	3	3	40	60	25	25	150
2	66442	Estimating & Costing-1	2	3	3	40	60	25	25	150
3	66443	Civil Engineering Drawing-2 (CAD)	1	6	3	20	30	50	50	150
4	66444	Surveying-2	2	3	3	40	60	25	25	150
5	66445	Geotechnical Engineering	2	3	3	40	60	25	25	150
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
		Total	13	18	19	260	390	150	150	950

66441	Structural Mechanics	T	P	C
		2	3	3

AIMS:
• To enable to apply the knowledge of scientific principles to problems of mechanical nature.
• To develop an understanding of mechanical properties of materials.
• To assist in applying mathematical and geometrical calculations to the analysis of statically
  determinate beams.

SHORT DESCRIPTION

Mechanical properties of material; Laws of forces; Moment; Friction; Centroid and centre of gravity; Moment of inertia; Torsion on circular shaft; Shear force and bending moment.

DETAIL DESCRIPTION

Theory:

1.0 Understand the important aspects of mechanical properties of materials.
  1.1 Mention the necessity to know about the mechanical properties of materials.
  1.2 Define the following terms:
     a. Stress, tensile stress, compressive stress, shear stress.
     b. Strain, tensile strain, compressive strain, shear strain,
     c. Hooke's law, modulus of elasticity and modulus of rigidity.

  1.3 Explain stress-strain diagram of mild steel and concrete.
  1.4 Define the following terms:
     a. Elasticity, proportional limit, yield point, ultimate stress, breaking stress, working stress and factor of safety.
     b. Strength, stiffness, toughness, ductility, malleability, brittleness, creep, fatigue failure, resilience, modulus of resilience, thermal stress in simple bar and poisons ratio.

  1.5 Compute stress, strain, modulus of elasticity and modulus of rigidity.
  1.6 Solve problems involving resilience, thermal stress and poisons ratio.
  1.7 Compute stress develop in composite bar under tension and compression.

2. Understand the concept of laws of forces.
  2.1 Explain the laws of forces.
  2.2 Define the following terms:
     Force, co-planar forces, non-coplanar forces, concurrent forces, non-concurrent forces, co-linear forces, parallel forces, laws of equilibrium of forces.

  2.3 Mention the parallelogram laws of forces.
  2.4 State the composition of forces and resolution of force.
  2.5 Define component of force, rectangular component and resultant of forces.
  2.6 Compute the resultant force-
       a. Triangle of forces
       b. Polygon of forces
       c. Converse laws of triangle and polygon laws of forces graphically.

  2.7 Calculate the resultant of forces: co-planar forces, concurrent forces, parallel forces and co-linear forces
  2.8 Explain Lami's theorem.
  2.9 Solve problems on Lami's theorem.

3. Understand the aspects of moment of forces.
  3.1 Define the term moment (analytically and graphically).
  3.2 Differentiate moment with force.
  3.3 Explain Varigon's principle of moment.

3.4 Distinguish like and unlike parallel forces.
3.5 State the meaning of couple.
3.6 Mention the properties of couple.
3.7 Solve problems on moment of couple and moment of forces.
3.8 Solve problems on moment of like and unlike parallel forces.

4. Understand the concept of frictional forces.
4.1 State friction, static friction and dynamic friction.
4.2 Mention the laws of static friction and dynamic friction.
4.3 Explain angle of friction and co-efficient of friction.
4.4 Compute friction of a body on horizontal planes.
4.5 Compute friction of a body on inclined planes.
4.6 Compute frictional force acting on a ladder.

5. Understand the aspects of centroid and centre of gravity.
5.1 Define the terms: centroid and centre of gravity.
5.2 State the axis of symmetry and parallel axis.
5.3 Compute the centroid by the method of moment of the following sections:
   a. rectangular   b. triangular   c. circular   d. semi-circular
   e. hollow   f. I –shaped   g. T –shaped   h. L -shaped

5.4 Solve problem on centre of gravity of a composite parallelepiped body.

6. Understand the concept of moment of inertia.
6.1 State 1st and 2nd moment of area.
6.2 Explain the meaning of radius of gyration.
6.3 Mention the theorems of moment of inertia.
6.4 Compute the moment of inertia of plane area about any axis of the following sections:
   a. rectangular   b. triangular   c. circulard. semi-circular
   e. hollow   f. I –shaped   g. T –shaped h. L -shaped

7. Understand the aspects of torsion on solid and hollow circular shaft.
7.1 State the laws of motions.
7.2 Explain the term circular motion.
7.3 Define the terms: torsion and torsional stress.
7.4 Mention the fundamental assumptions of torsional stress.
7.5 Find the relation between torsional stress and strain.
7.6 Interpret the formulas relating to finding torque
7.7 Solve problems involving torsion.

8. Understand shear force (SF) and bending moment (BM).
8.1 Define the term `beam'.
8.2 List different types of beams.
8.3 Mention various types of load on beams.
8.4 Define shear force and bending moment.
8.5 Differentiate between shear force and bending moment.
8.6 Mention the sign conventions of shear force and bending moment.
8.7 List the characteristics of shear force and bending moment diagram.
8.8 Calculate and draw SF and BM diagram of cantilever beams with point load, distributed load and both.
8.9 Calculate and draw SF and BM diagram of simply supported beams with point load, distributed load and both.
8.10 Calculate and draw SF and BM diagram of simply supported overhanging beam with point load, distributed load and both.

PRACTICAL:
1. Perform compression test of a timber specimen.
2. Conduct tensile test of mild steel rod and draw stress-strain curve with test results.
3. Determine the percentage elongation of mild steel.
4. Determine the centroid of a composite area.
5. Determine the resultant of a force system graphically.
6. Show the resultant of forces by using force board.
7. Prove the Lami's theorem by using force board.
8. Practice to determine the co-efficient of friction of timber, concrete and mild steel.
9. Practice to determine reactions of a beam by using spring balance.

REFERENCE BOOKS:
1. Structural Mechanics   - W Morgan and D T Williams
2. Structural Mechanics   - Singer / Popov
3. Mechanics of Materials - Philip Gustave Laurson and Williams Junkin Cox
4. Structural Mechanics   - A. K. Upadhyay Published by SK Kateria & Sons, India.
5. Applied Mechanics   - R.S Khurmi

66442   Estimating & Costing – I   **T P C**
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AIMS:
- To provide the ability of quantity analysis of civil engineering works.
- To enable to estimate volume quantities of materials used in construction works.
- To provide understanding cost abstract of civil engineering works.
- To be able to improve knowledge and skill of estimating two storied building consisting of spread footing.
- To develop skill in estimating RCC and bituminous road.
- To develop skill in rate analysis process for different items of work in the building trades.

SHORT DESCRIPTION:
Introduction to estimating, Quantity estimation of excavating tank, road embankment, canal digging, steps, boundary wall, bituminous & RCC road, estimate of a single storied two- roomed building with verandah and double storied building, rate analysis.

DETAIL DESCRIPTION:
Theory:

1. **Understand the basic concept of estimating.**
   1.1   Define the term estimating.
   1.2   State the methods of estimating.
   1.3   Mention the rules and methods of measurements of works.
   1.4   Mention the rules of deduction for opening, bearing portion etc. in masonry works.
   1.5   List unit weight of different materials used in construction works
   1.6   Write the unit of different items of construction works as per standard practice.

2. **Estimate the volume of earth work for excavating a tank**
   2.1   Mention the rules of finding out the volume of earth work by mid area method, mean area method & prismoidal method.
   2.2   Mention the comparison with computing volume by three methods.
   2.3   Calculate the volume of earth work in excavation of a tank by mid area method.
   2.4   Calculate the volume of earth work in excavation of a tank by mean area method.
   2.5   Calculate the volume of earth work in excavation of a tank by prismoidal method.

3. **Estimate the volume of earth work for road embankment.**
   3.1   Identify the side slopes for different heights of road embankment.
   3.2   Identify the cross section of road embankment.
   3.3   State the method of finding out the volume of earth work in embankment by mid area method, mean area method & prismoidal method.
   3.4   State the finding out the volume of earthwork partly cutting & partly filling of road.
   3.5   Calculate the volume of earth work in embankment by mean area method.
   3.6   Calculate the volume of earth work in embankment by mid area method.
   3.7   Calculate the volume of earth work in embankment by prismoidal method.
   3.8   Calculate the volume of earth work for a road partly banking and partly cutting.

4. **Estimate the volume of earth work for canal digging.**
   4.1   Identify the cross section of partly banking and partly cutting.
   4.2   Explain the method of finding out volume of earth work for partly cutting and partly banking.
   4.3   Explain the terms lead and lift

5. **Estimate the different quantities of item of works in steps, boundary wall and roads.**
   5.1   Identify different parts of a step and calculate the quantities of works.
   5.2   List different items of works in a boundary wall.
   5.3   List different items of works in a bituminous road.

5.4   List different items of works in a RCC road.

5.5   Prepare an estimate for construction of 100m long boundary wall.

5.6   Prepare an estimate for construction of 100m long bituminous road.

5.7   Prepare an estimate for construction of 100m long RCC road.

6. **Understand the procedure of estimate of a single storied two room building with a verandah.**

6.1   State centre line and separate wall method.

6.2   Mention the advantage and disadvantage of centre line and separate wall methods.

6.3   Explain the methods of deduction for opening or over lapping.

6.4   Define the terms sub-structure and super- structure.

6.5   Calculate the earth work in excavation of foundation trenches.

6.6   Calculate the brick work (1:6) in foundation up to plinth level.

6.7   Calculate the wood work in door and window frames.

6.8   Calculate the wood work in door and window shutters.

7. **Understand the basic concept of rate analysis.**

7.1   State meaning of rate analysis. .

7.2   Explain the purposes of rate analysis.

7.3   Explain the terms: contractors profit, overhead charges, contingency sundries and lump sum (LS)

7.4   Explain the unit rate of materials & labour.

7.5   Mention the advantage of rate analysis to prepare cost estimate.

7.6   Determine the analysis of rates for different items of building works.

   a)   Brick flat soling & herring bone bond (10 sqm).

   b)   125 mm thick & 250 mm thick brick work (10cum).

   c)   Cement concrete (1:3:6) work for 10cum.

   d)   R.C.C. works (1:2:4) for 10cum.

   e)   Plastering work with cement mortar (1:6) for10 sqm.

PRACTICAL

1.   Determine the rate of different categories of labour considering the work site including lead and lift.

2.   Calculate the quantity of cement, sand and brick required for 10 cum masonry work using (1:6) mortar.

3.   Calculate the quantity of cement, sand and brick required for 10 sqm brick masonry work (125mm thick wall) with 1:4 mortar.

4.   Calculate the quantity of cement, sand and brick khoa required for 10 cum reinforced cement concrete (1:2:4) work.

5.   Prepare an estimate for construction of underground water reservoir.

6.   Prepare an estimate for making wooden chair/ table/almirah.

7.   Calculate the quantity of following items of work of a double storied building with verandah.

   7.1   One layer brick flat soling in foundation and floor.

   7.2   Cement concrete work (1:3:6) in foundation and floor.

   7.3   Earth work in filling the sides of foundation trenches and plinth.

   7.4   Brick work (1:6) in super structure.

   7.5   125 mm thick Brick work (1:4) in partition wall.

   7.6   RCC work (1:2:4) in lintel, beams, roof slab, stair, sunshade and drop wall.

   7.7   Mild steel bar reinforcement fabrication in different RCC works when percentage given.

   7.8   Grill work for windows.

   7.9   Cement plaster to both sides of brick wall.

   7.10 Cement plaster to all RCC surface.

   7.11 Cement plaster to plinth wall and skirting with neat cement finishing (NCF).

   7.12 Patent stone flooring (PSF)

   7.13 Lime terracing over RCC roof slab.

   7.14 White washing/distempering.

   7.15 Color washing/ snowcem washing/weather coat.

REFERENCE BOOKS:

   1. Estimating and costing - B N Datta

   2. Estimating and costing - Gurucharan Singh

66443   **Civil Engineering Drawing -2(CAD)**   **T P C**
                                                                  1 6 3

AIMS
- To enable in learning detail drawing of building components.
- To enable to understand and perform computer aided design (AutoCAD).
- To be able to prepare production drawing of a multi-storied building.
- To be able to prepare detail drawing of building components.
- To be able to acquire knowledge and skill to prepare detail working drawing of a scheme.
- To be able to interpret the structural drawings of a multi-storied building.
- To be able to prepare production drawing of multi-storied building adopting **CAD.**

SHORT DESCRIPTION

Computer Aided Design(CAD) and plotting; 2D & 3D CAD commands; Multi-storied building; Multi-storied building (CAD); Detail working drawing (CAD) of RCC column with footing; Lintel with sunshade; Retaining wall; Foundation; Beam; Slab; Stair case, ramp and lift core; Underground water reservoir; Septic tank.

DETAIL DESCRIPTION

Theory:

1.   Understand the functions and uses of different CAD commands.
    1.1   Define Computer Aided Design (CAD).
    1.2   State how to start and exit CAD.
    1.3   Name different tools used in CAD.
    1.4   State the meaning of WCS icon and UCS icon.
    1.5   Mention the classifications of co-ordinate system.
    1.6   State the necessity of drawing units and limits.

2.   Understand the functions and uses of different CAD commands.
    2.1   Mention the functions of the following editing commands: copy, move, array, offset, trim, fillet, chamfer, extend, break, rotate, stretch, mirror, change, scale and pedit.
    2.2   State how to use of the following draw commands: line, triangles, rectangle, polygons, circles, arcs, etc.
    2.3   Mention the functions of the following object grouping commands: block, insert, explode, divide, measure, purge, etc.
    2.4   Mention the functions of the following enquiry commands: dist, area, Id, list etc.
    2.5   Mention the functions of the following plotting commands: layout, view port, model space, paper space.
    2.6   Mention the functions of the following dimension commands: dimension style, leader, linear dimension, radius & diameter dimension, aligned dimension, continue dimension, base dimension etc.
    2.7   Mention the functions of the following geometric commands: donut, solid, trace, pline, xline, ray, fill etc.
    2.8   Mention the functions of the following commands: zoom, pan, undo, redo, save, etc.
    2.9   State the necessity of hatch and text.
    2.10 State the functions of Auto CAD design center (ADC).
    2.11 Define Layer, Layer on/off and formation of Layer.
    2.12 Mention the advantages of Layers in drawing using CAD.

3.   Understand the features of multi-storied building.
    3.1   Define multi-storied building.
    3.2   Mention the advantages and limitations of multi-storied building.
    3.3   Describe the main features of a multi-storied building.
    3.4   Describe the process of drawing of a multi-storied building.
    3.5   List the drawings of a multi-storied building necessary for approval of the relevant authorities.

4. **Understand the preparation of plan, section, elevation and other components of multi-storied framed structure building using CAD.**
   4.1   Describe the process of drawing site plan and layout plan of a multistoried framed structure building.
   4.2   Describe the process of drawing floor plan, elevation and sectional elevation of a multi-storied framed structure building.
   4.3   Describe the process of making detailed drawing of beam, floor slab and lintel of multi-storied building.
   4.4   Describe the process of drawing plan of square and rectangular column with footing showing reinforcement.
   4.5   Describe the process of making detailed drawing of RCC lintel with sunshade showing reinforcement.

5. **Understand the preparation of elevation and cross section of RCC cantilever retaining wall using CAD.**
   5.1   Describe the process of making the detail elevation of RCC retaining wall showing curtailment of reinforcement.
   5.2   Describe the process of drawing cross section of RCC retaining wall.
   5.3   Describe the process of drawing the counter fort details showing reinforcement including retaining wall.

6. **Understand the preparation of detailed drawing of foundation using CAD.**
   6.1   Describe the process of drawing spread footing foundation.
   6.2   Describe the process of drawing raft foundation showing the reinforcement detail.
   6.3   Describe the process of drawing plan and sectional elevation of pile showing the reinforcement detail.
   6.4   Describe the process of drawing plan and sectional elevation of pile cap showing the reinforcement detail.
   6.5   Describe the process of drawing plan and cross sectional elevation of well foundation showing the reinforcement.

7. **Understand the preparation of working drawing of continuous rectangular beam and T-beam using CAD.**
   7.1   Describe the process of making detail drawing of RCC fully continuous rectangular beam showing reinforcement.
   7.2   Describe the process of making detail drawing of RCC fully continuous T-beam showing reinforcement.
   7.3   Describe the position of reinforcement in the junction of column with beam.

8. **Understand the preparation of plan and section of one -way and two-way slab using CAD.**
   8.1   Describe the process of making detailed drawing of semi-continuous one- way slab showing reinforcement.
   8.2   Describe the process of making detailed drawing of fully continuous one- way slab showing reinforcement.
   8.3   Describe the process of making detailed drawing of semi-continuous two- way slab showing reinforcement.
   8.4   Describe the process of making detailed drawing of fully continuous two-way slab showing reinforcement.

9. **Understand the preparation of plan and sectional elevation of a half turn staircase, ramp and lift core using CAD.**
   9.1   Describe the process of drawing the plan of a half turn staircase.
   9.2   Describe the process of drawing the sectional elevation of a half turn staircase.
   9.3   Describe the process of making detailed drawing of a half turn staircase showing reinforcement.
   9.4   Describe the process of drawing ramp with showing reinforcement.
   9.5   Describe the process of making plan and section of lift core showing the reinforcement.

10. **Understand the preparation of plan and sectional elevation of an underground water reservoir and septic tank using CAD.**
    10.1   Describe the process of drawing plan and sectional elevation of an underground water reservoir showing the reinforcement.
    10.2   Describe the process of drawing plan and sectional elevation of a septic tank.
    10.3   Describe the process of drawing plan and section of soak pit and inspection pit.
    10.4   Describe the process of detail drawing of a water closet including gully trap.

PRACTICAL:

1. Prepare geometrical drawing using CAD.
   1.1   Make an Auto CAD new file
   1.2   Set up the units, display formats and precision of measurements.
   1.3   Set up the drawing limits.
   1.4   Make a grid of dots similar to graph paper.

2. Draw and save drawing using CAD.
   2.1   Draw a line using CAD.
   2.2   Draw triangles using CAD.
   2.3   Draw different types of rectangles using CAD.
   2.4   Draw different types of polygons using CAD.
   2.5   Draw circles, arcs, etc using CAD.
   2.6   Save the existing drawing.

3.   Edit the existing drawing using CAD.
   3.1   Erase a line using commands.
   3.2   Unerase an erased line using undo and redo commands.
   3.3   Magnify a portion of the drawing to look closely.
   3.4   Regenerate the whole drawing.
   3.5   Trim and extend a portion of a line, area, curve or any object.
   3.6   Move and copy a drawing from one place to another.
   3.7   Use commands to filled lines, areas and circles.
   3.8   Use commands to chamfer lines.
   3.9   Perform the uses of the following commands: array, offset, break, rotate, stretch, mirror, change, scale, pedit and explode.

4. Dimension a drawing using CAD.
   4.1   Select a drawing file for dimensioning.
   4.2   Use commands to add linear dimensions in the drawing.
   4.3   Use commands to add angular dimensions in the drawing.
   4.4   Use commands to modify dimension style in the drawing.

5. Layers and hatches the drawing using CAD.
   5.1   Create different layers for line, dimension, text, hatches, etc.
   5.2   Select different color for different layer.
   5.3   Select the type and scale of the hatch for a drawing.
   5.4   Select the type and size of the text for a drawing.
   5.5   Insert text in the drawing.
   5.6   Perform the uses of the following plotting commands: layout, view port, model space, paper space.

6.   Use text and plot the drawing.
   6.1   Select the type and size of the text for a drawing.
   6.2   Insert text in the drawing.
   6.3   Perform the uses of the following plotting commands: layout, view port, model space, paper space.
   6.4   Plot the drawing.
   6.5   Plot each layer of the drawing separately.

7. Prepare plan, section and elevation of multi-storied building using CAD.
   7.1   Draw the site plan and layout plan of a multi-storied framed structure building.
   7.2   Draw the plan, elevation and sectional elevation of a framed structure building.
   7.3   Draw the detailed drawing of beam, roof slab and lintel of the building.
   7.4   Draw the detailed drawing of staircase, ramp and lift core of the building.
   7.5   Draw the RS plot map showing the site of the building with necessary items for approval of the relevant authorities.

8. **Prepare the working drawing of RCC column with footing, raft and pile foundation using CAD.**
    8.1 Draw the plan of square and rectangular column with footing showing the reinforcement.
    8.2 Draw the sectional elevation of RCC column showing the reinforcement.
    8.3 Draw the detailed working drawing of circular RCC column with footing showing reinforcement.
    8.4 Draw the detailed drawing of raft foundation.
    8.5 Draw the detail drawing of pile with pile cap.

9. **Prepare the working drawing of RCC lintel with sunshade and RB lintel using CAD.**
    9.1 Draw the detailed drawing of RCC lintel showing the reinforcement.
    9.2 Draw the detailed drawing of RCC lintel with sunshade showing reinforcement.
    9.3 Draw the detailed drawing of RB lintel.

10. **Prepare elevation and cross section of cantilever RCC retaining wall using CAD.**
    10.1 Draw the detailed elevation of RCC retaining wall showing curtailment of reinforcement.
    10.2 Draw the detailed cross section of cantilever retaining wall.
    10.3 Draw the counterfort retaining wall showing details reinforcement.

11. **Prepare the working drawing of continuous rectangular beam and T-beam using CAD.**
    11.1 Draw the detailed drawing of RCC fully continuous rectangular beam showing reinforcement.
    11.2 Draw the detailed drawing of RCC fully continuous T-beam showing reinforcement.
    11.3 Draw the junction of column and beam showing the reinforcement.

12. **Prepare plan and section of one-way and two-way slab using CAD.**
    12.1 Draw the detailed drawing of semi-continuous one-way slab showing reinforcement.
    12.2 Draw the detailed drawing of fully continuous one-way slab showing reinforcement.
    12.3 Draw the detailed drawing of semi-continuous two-way slab showing reinforcement.
    12.4 Draw the detailed drawing of fully continuous two-way slab showing reinforcement.

13. **Prepare the plan and sectional elevation of a half turn staircase using CAD.**
    13.1 Draw the plan of a half turn staircase.
    13.2 Draw the sectional elevation of a half turn staircase.
    13.3 Draw the detailed drawing of a half turn staircase showing reinforcement.
    13.4 Draw the detailed drawing of a ramp showing reinforcement.
    13.5 Draw the detail drawing of a lift core showing reinforcement.

14. **Prepare detail drawing of underground water reservoir and septic tank using CAD.**
    14.1 Draw the plan and sectional elevation of an underground water reservoir showing the reinforcement.
    14.2 Draw the plan and sectional elevation of a septic tank.
    14.3 Draw the plan and section of soak pit and inspection pit.
    14.4 Draw the detailed drawing of a water closet including gully trap.

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.

66444	Surveying – II	T	P	C
		2	3	3

AIMS:

At the end of the course the students will be able:
- To use level and theodolite.
- To conduct leveling work.
- To recognize errors in leveling.
- To conduct traversing with theodolite.
- To determine horizontal and vertical distances of inaccessible points.

SHORT DESCRIPTION

Leveling; Errors in leveling; Contouring; Theodolite traversing, Trigonometrical leveling and Topographic surveying,

DETAIL DESCRIPTION

Theory:

1 **Understand the concept of leveling.**
    1.1 Define Level and Leveling
    1.2 Describe the purpose of leveling.
    1.3 Explain the following terms in leveling:
        a) Level surface   b) Level line   c) Horizontal surface d) Horizontal line
        e) Vertical plane   f) Vertical line   g) Datum surface   h) Datum line
        i) Reduced level   j) Formation level

    1.4 Define bench mark.
    1.5 Mention the classification of bench marks.
    1.6 Describe different types of bench mark.

2 **Understand the features of leveling instruments and their application.**
    2.1 List the equipment and accessories required for leveling.
    2.2 Identify the different types of level.
    2.3 Label the different parts of a level.
    2.4 Explain the following terms related to leveling:
        a) Line of collimation b) Axis of telescope   c) Axis of bubble tube   d) Vertical axis
        e) Height of instrument   f) Plane of collimation   g) Focusing   h) Parallax
    2.5 Mention the purposes of leveling staff.
    2.6 Identify different types of leveling staff.
    2.7 Identify the positions of setting up level.
    2.8 Mention the procedure of holding a leveling staff.
    2.9 Mention the procedure of taking staff reading.

3 **Understand the adjustment of level.**
    3.1 Mention different types of adjustments of level.
    3.2 Mention the different steps of temporary adjustment.
    3.3 Identify the fundamental lines of level with their relationship.
    3.4 Describe permanent adjustment of level.
    3.5 Solve problems on permanent adjustments of level.

4 **Understand booking of staff reading and reduction of level.**

4.1 Define back sight, foresight and intermediate sight reading, change point, negative staff reading and station

4.2 State the necessity of different types of level book.

4.3 Describe reduction of leveling.

4.4 Mention the procedure of booking of staff reading into level book.

4.5 Compare different methods of reduction of leveling.

4.6 Solve problems on reduction of leveling.

4.7 Solve problems on calculation of missing data of old level book.

5 **Understand various types of leveling.**

5.1 List different types of leveling.

5.2 State the purposes of fly leveling, profile leveling, cross sectioning, check leveling and reciprocal leveling

5.3 Describe the procedure of fly leveling; profile leveling, cross sectioning, check leveling and reciprocal leveling.

5.4 Solve different problems on fly leveling; profile leveling, cross sectioning, check leveling and reciprocal leveling.

5.5 Describe the procedure of plotting long and cross-section of leveling works.

5.6 Prepare longitudinal profile and cross profile from given data.

6 **Understand the obstacles and errors in leveling.**

6.1 Identify obstacles in leveling.

6.2 Mention the procedure of leveling in the following cases:

  a) Ascending and descending a hill.

  b) Staff too near the level.

  c) Staff too low or too high.

  d) Staff station above the line of collimation.

  e) Wall on the alignment.

6.3 List the instrumental and personal errors in leveling.

6.4 Explain the effects of earth's curvature and refraction of light on leveling.

6.5 Interpret the formula for earth curvature and refraction of light.

6.6 Solve problems on errors due to curvature and refraction.

6.7 Deduce the formula for distance to the visible horizon and dip of the horizon.

6.7 Solve problems on visible horizon and dip of the horizon.

6.9 Specify the magnitude and permissible limits of closing error in leveling.

7 **Understand the aspects of contouring and mapping**

7.1 Define contour, contouring, horizontal equivalent and vertical interval.

7.2 Mention the characteristics of contour.

7.3 Describe the uses of contour.

7.4 Mention the different methods of contouring.

7.5 State the procedure of different methods of contouring.

7.6 Explain interpolation of contour by estimation method only.

7.7 Mention the procedure of drawing contour map of hill, reservoir, valley etc.

7.8 Mention various uses of contour map.

7.9 State the procedure of locating the proposed route for a road, canal and drainage work.

8 **Understand the fundamentals of theodolite.**

8.1 Identify the parts of theodolite.

8.2 Mention the functions of different parts of theodolite.

8.3 State the meaning of diaphragm, lens, centering, transiting and swing, display board.

8.4 Describe different types of adjustment of theodolite

8.5 State different steps of temporary adjustment of theodolite.

8.6 Describe the fundamental lines of theodolite.

8.7 Mention the relations among the fundamental lines.

8.8 Describe the permanent adjustments of theodolite.

9   Understand the principles of measuring angle and bearing with theodolite.
   9.1   Mention the procedure of measuring horizontal angles with theodolite.
   9.2   Mention the procedure of measuring vertical angles.
   9.3   Mention the procedure of measuring magnetic bearing of a line.
   9.4   Mention the procedure of determining true bearing of a line by observing pole star.

10   Understand the application of trigonometrical leveling.
   10.1   Explain the basic principle of trigonometrical leveling.
   10.2   Describe the method of measuring height when the object is accessible.
   10.3   Express the deduction of the formula for measuring height and horizontal distance when the object is at accessible in the case of object and the station are in different levels.
   10.4   Express the deduction of the formula for measuring height and horizontal distance when the object is inaccessible in the case of object and the station are in different levels.
   10.5   Solve problems on finding heights and distances.

11   Understand the principles of traverse survey.
   11.1   Explain the meaning of traverse.
   11.2   List the field works in theodolite traversing.
   11.3   Describe the traversing by methods of included angles and deflection angle.
   11.4   Explain the term checking of traverse.
   11.5   Explain the process of plotting a traverse.
   11.6   Calculate the bearing from angles of traverse.
   11.7   Compute the coordinates of a traverse.
   11.8   Describe the Bowditch's rule and Transit rule.
   11.9   Define Balancing of closed traverse.

12   Understand the concept of solving problem in traversing.
   12.1   Describe different types of problems in traversing.
   12.2   Identify the sources of errors in theodolite work.
   12.3   List the common mistakes in theodolite work.
   12.4   Calculate the length and bearing of a missing side and any included angle of a traverse.
   12.5   Compute the area of closed traverse by coordinate, latitude and double meridian, departure and total latitude methods.
   12.6   Explain the way to avoid errors & mistakes in theodolite work.

13   Understand the concept of topographic surveying.
   13.1   State the meaning of topographic survey and the relief.
   13.2   Explain the methods of representation of relief.
   13.3   Mention the procedure of topographic survey.
   13.4   Explain the method of locating horizontal and vertical control.
   13.5   Explain the method of locating contours.
   13.6   Explain the method of locating details.
   13.7   Describe the procedure of plotting a topographic map.

PRACTICAL:

   1 Demonstrate the components of level.
   2 Perform temporary adjustments of level.
   3 Conduct fly leveling.
   4 Conduct two-peg test.
   5 Conduct profile leveling, cross-sectioning and plot level sections.
   6 Conduct reciprocal leveling and check leveling.
   7 Conduct contouring by direct method over a low lying/elevated area.
   8 Prepare contour map and conducting spot leveling.
   9 Determine horizontal angle and vertical angle using digital theodolite.
   10   Determine height and distance of a tower using digital theodolite.
   11   Conduct traversing with a theodolite and plot maps including computation of area.

REFERENCE BOOKS:

1 Surveying & Leveling   − T P Kanetker

2 Surveying   − Norman Thomas

3 Surveying Volume *I* and *II*   − Dr. B.C. PunMia

4 Surveying   − S.K. Hossain

66445   **Geotechnical Engineering**   **T P C**
                                                                              2 3 3

AIMS:

At the end of the course the student will be able:

- To understand of the origin, composition, classification and properties of soil.
- To assist in understanding the plasticity characteristics and hydraulic properties of soil.
- To assist in understanding the consolidation characteristics of soil.
- To assist in understanding the lateral earth pressure of soil.
- To provide understanding of the site investigation and method of sample collection.
- To provide basic field skill for collection of soil sample.
- To provide basic laboratory skill required to determine soil properties and to perform the relevant calculations.

SHORT DESCRIPTION:

Introduction to geotechnical engineering; Preliminary definition and simple tests; Particle size of soil; Plasticity characteristic of soil; Hydraulic properties of soil; Consolidation characteristics of soil; Subsurface investigation; Lateral earth pressure; Bearing capacity of soil.

DETAIL DESCRIPTION:

Theory:

1. **Understand the basic concept of geotechnical engineering.**
   1.1 Define rock, soil and soil engineering.
   1.2 Describe origin and formation of soil.
   1.3 Describe major soil deposits in Bangladesh.
   1.4 Explain limitation of soil engineering.
   1.5 Mention the soil classification system.
   1.6 State textural, AASHO and unified ASTM system.
   1.7 State field identification test such as; dilatancy, toughness, dry strength test & shaking test.
   1.8   List general properties of soil.

2. **Understand preliminary soil tests.**
   2.1 Define the following terms: void ratio, porosity, degree of saturation, percentage of air voids, air content, water content, bulk unit weight, dry unit weight, saturated unit weight, submerged unit weight, unit weight of solids, specific gravity of solids, density index.
   2.2 Explain three-phase diagram in terms of void ratio.
   2.3 Explain three-phase diagram in terms of porosity.
   2.4 Solve problems on soil properties.
   2.5 Explain oven drying method of water content determination.
   2.6 Explain specific gravity determination by pycnometer method.

3. **Understand the particle size of soil.**
   3.1 Define index properties of soil.
   3.2 State mechanical analysis of soil.
   3.3 Describe sieve analysis.
   3.4 Mention and interpret stokes law.
   3.5 Describe particles size analysis by hydrometer.

4. **Understand the plasticity characteristics of soil.**
   4.1 Define: plasticity of soil, Atterberg limit, liquid limit, plastic limit, shrinkage limit,
   4.2 Explain plasticity index, liquidity index, consistency index, flow index and toughness index.
   4.3 State the method of measurement of consistency.
   4.4 Define the terms: sensitivity and thixotropy.
   4.5 List the uses of consistency (Atterberg) limits.

5. **Understand the hydraulic properties of soil.**
   5.1 Define the following: Permeability of soil, hydraulic head, piezometric head, position head.
   5.2 State & Explain Darcy's law.
   5.3 State the constant head and variable head permeability test for determination of co-efficient of permeability.
   5.4 Describe the pumping out tests for determination of coefficient of permeability.
   5.5 Compute effective pressure and pore water pressure.
   5.6 List the factors affecting permeability of soil.
   5.7 Define seepage pressure, seepage velocity, equipotential line and flow net.

6. **Understand the consolidation characteristics of soil.**
   6.1 Define consolidation
   6.2 Classify & explain consolidation.
   6.3 State behavior of saturated soil under pressure.
   6.4 Identify triaxial compression test apparatus.
   6.5 Differentiate between consolidation and compaction of soil.
   6.6 State standard proctor test of compaction.
   6.7 Explain optimum moisture content & percent compaction.
   6.8 State unconfined test.
   6.9 State confined compression test.

7. **Understand the purpose of subsurface investigation.**
   7.1 State subsurface investigation of soil.
   7.2 Mention the stages in subsurface explorations.
   7.3 Mention the purposes of subsurface investigation of soil.
   7.4 Compute the depth and lateral extent of explorations.
   7.5 Describe the open excavation (Test Pit) methods of explorations.
   7.6 Describe auger boring, wash boring, and rotary drilling.
   7.7 Identify various types of soil samples.
   7.8 Identify split barrel sampler, spring core catches, scraper bucket and piston sampler for collecting samples.
   7.9 Describe the method of standard penetration test (SPT).
   7.10 State the procedure of writing subsoil investigation report.

8. **Understand the aspect of lateral earth pressure.**
   8.1 State the meaning of at-rest pressure, active earth pressure and passive earth pressure.
   8.2 explain active and passive earth pressure of Rankine's theory with non-surcharge.
   8.3 State the formula of active earth pressure of Rankine's theory with surcharge.
   8.4 State the fundamental assumptions of Coulomb's wedge theory.
   8.5 State the formula of active earth pressure of Coulomb's theory with surcharge.

9. **Understand the bearing capacity of soil.**
   9.1 Define bearing capacity of soil.
   9.2 Correlate between penetration resistance and unconfined compressive strength for cohesive soil.
   9.3 Correlate between penetration resistance and angle of shearing resistance for cohesion less soil.
   9.4 Explain the bearing capacity from Standard Penetration Test (SPT).
   9.5 List the causes of foundation settlement.

PRACTICAL:

1. Determine the water content of soil by oven drying method.
2. Determine the specific gravity of soil by pycnometer method.
3. Determine bulk unit weight & dry unit weight of soil.
4. Determine the particle size of soil by sieve analysis.
5. Determine the particle size of soil by hydrometer analysis.
6. Determine the liquid limit of soil by casagrand's apparatus.
7. Determine the plastic limit of soil.
8. Determine the co-efficient of permeability of soil by constant head test.
9. Determine the shear strength of soil using vane shear test.
10. Determine the bearing capacity of soil from Standard Penetration Test (SPT).
11. Determine the amount of compaction and the water content by standard proctor test.
12. Determine the shear characteristics of soil by unconfined compression test.

REFERENCE BOOKS:

1   Foundation Engineering   -   Ralph B Peck, Walter, E Hanson
2   Soli Mechanics and Foundation Engineering   -   Dr. K. R.Arora.
3. Soil Mechanics and Foundation   -   Dr. B. C.Punmia.
4 . Foundation Analysis and Design   -   Josef and Vawels.

69054   Environmental Studies   T   P   C
                                                                      2   0   2

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, Sauders 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