BANGLADESH TECHNICAL EDUCATION BOARD

Agargaon, Dhaka-1207

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM

SYLLABUS (PROBIDHAN-2016)

SURVEYING TECHNOLOGY

TECHNOLOGY CODE: **678**

7th SEMESTER

DIPLOMA IN ENGINEERING

PROBIDHAN-2016

SURVEYING TECHNOLOGY (678)

7th SEMESTER

Sl. No	**Subject code**	**Name of the subject**	**T**	**P**	**C**	**MARKS**				
						Theory		**Practical**		**Total**
						Cont. assess	Final exam.	Cont. assess	Final exam.	
1	67871	Hydrographic & Route Survey	2	6	4	40	60	50	50	200
2	67872	Mine Surveying	2	3	3	40	60	25	25	150
3	67873	Surveying Project	0	6	2	-	-	50	50	100
4	66473	Transportation Engg-2	2	3	3	40	60	25	25	150
5	66474	Design of Structure -2	2	3	3	40	60	25	25	150
6	68873	Construction Management & Documentation	2	3	3	40	60	25	25	150
7	65853	Innovation & Entrepreneurship	2	0	2	40	60	-	-	100
		Total	**12**	**24**	**20**	**240**	**360**	**200**	**200**	**1000**

67871	Hydrographic & Route Survey	T	P	C
		2	6	4

AIMS

- To be able to develop knowledge, skill and attitude of conducting hydrographic survey.
- To be able to conduct sounding.
- To able to acquire knowledge & skill of drawing the cross section of river/channel bed.
- To able to gain knowledge about morphology of river/channel.
- To able to apply common flow measuring instrument to measure the Velocity of water in river or channel.
- To able to determine the discharge through river or canal.
- To able to understand route survey and modes of performing route survey of any project.

SHORT DESCRIPTION

Hydrographic survey; Map Projection; Sounding; Reduction of sounding; Principle of measuring Velocity & discharge; Computing discharge; Concept of route survey; Setting out works of plans/alignment.

DETAIL DESCRIPTION

Theory:

1. **Understand the concept of hydrographic survey.**
   - 1.1 Define hydrographic survey.
   - 1.2 Explain the purpose of hydrographic survey.
   - 1.3 Describe the horizontal and vertical control of hydrographic survey.
   - 1.4 Explain the methods of establishing horizontal and vertical controls.
   - 1.5 Describe shore line survey.
   - 1.6 Importance of oceanography.
   - 1.7 Describe the procedure of River/Canal survey by total station/echo sounder/fish finder.
   - 1.8 Describe digital hydrographic Charting System.
   - 1.9 Define different types of sonar (single beam, multi beam, side scan)
2. **Understand Map Projection.**
   - 2.1 Define Map Projection.
   - 2.2 Describe different types of map projection.
   - 2.3 Define Ellipsoid (WGS84, Everest 1830, UTM and BUTM).
   - 2.4 Define plane co-ordinate & geographical co-ordinate.
   - 2.5 Convert geographical co-ordinate to plane co-ordinate.
   - 2.6 Describe process to establish sea/river port by Arc-GIS.
3. **Understand the Sounding/Bathymetry.**
   - 3.1 Describe sounding.
   - 3.2 Describe the object of sounding.
   - 3.3 Describe methods of sounding.
   - 3.4 List the equipment for sounding.
   - 3.5 Define the following :
     - a) Sounding boat
     - b) Sounding rods (or poles)
     - c) Lead lines
     - b) Range Lines
     - e) Digital Echo sounding

4. **Understand the operation of sounding.**
   4.1 Describe the method of measuring angles with sextant/Total Station.
   4.2 Describe the duties and responsibilities of the members of the sounding party.
   4.3 Define DGPS.
   4.4 Describe the methods of taking sounding.
   4.5 Describe the methods of Locating sounding points by:
      a) Digital echo sounder, b) Hand held G.P.S.
      c) Precision survey type GPS (RTK or DGPS) d) Total station.
   4.6 Describe the procedure of echo-sounding and station pointer.
5. **Understand the problem of sounding.**
   5.1 Describe three points problem & its solution.
   5.2 Describe Advantages and Limitations of echo-sounder.
   5.3 Solve problems.
6. **Understand the reduction of sounding.**
   6.1 Describe reduction of sounding.
   6.2 Explain the terms:
      a) Low water of ordinary spring tide (LWOST)
      b) High water of ordinary spring tide (HWOST)
      c) Tide gauge.
   6.3 Describe the procedure of booking sounding.
   6.4 Describe the procedure of plotting sounding using graph paper, manually & AutoCAD.
7. **Understand the principle of measuring discharge.**
   7.1 Describe floats.
   7.2 Describe stream gauge.
   7.3 Describe the procedure of measuring gauge reading.
   7.4 Describe the method of measuring velocity by:
      a) Digital current meter, b) floats,
      c) Acoustic Doppler Velocity meter (ADV), d) Electro-Magnetic Velocity meter (EMV)
      e) Laser Doppler Velocity meter (LDV). f) Acoustic Doppler current profiler (ADCP)
   7.5 Describe the calibration process of digital current meter.
8. **Understand the method of computing discharge.**
   8.1 Explain the method of tracing float run.
   8.2 Describe the method of computing discharge from velocity & gauge reading.
   8.3 Compute discharge by the following:
      a) By graphical method b) By mean section method
      c) By mid section method d) By velocity control method
      e) By computer operation
   8.4 Solve problem.
9. **Understand route survey.**
   9.1 Describe route survey.
   9.2 Describe the steps of route survey.
   9.3 Describe location survey.
   9.4 List the instrument required for preliminary survey.
   9.5 Describe different methods of preliminary survey.
10. **Understand the project survey.**
   10.1 Define project survey.
   10.2 Define Chart Datum, PWD Datum,MSL(SOB).

10.3 Describe the process of hydrographic project survey.

10.4 Describe the process of tunnel (under water) project survey.

11.Understand the concept of setting out works plan/alignment.

11.1 Describe setting out works of plan/alignment.

11.2 List the instruments and accessories required for setting out works.

11.3 Describe the procedure of fixing the center line/ alignment of a route.

11.4 Describe the procedure of providing RL on different parts of the route.

11.5 Describe setting out works of a barrage.

PRACTICAL :

1. Conduct shore line survey with graph (Total Station/GPS).
2. Measure angle with Sextant/ Total station.
3. Generate Contours and quantity of water on the basis of collected raw data of river/pond/canal by AutoCAD/ hydrographic solution.
4. Measure the velocity of water of a River by.
   a) Digital Current meter.
   b) Acoustic Doppler current profiler (ADCP)
5. Compute discharge of a stream/river by ADCP.
6. Conduct route survey of any specific project.
7. Layout the alignment of the following(as per requirement)

a) Dam/barrage b) Irrigation canal

c) Sewer line. d) Tunnel

REFERENCE BOOKS

1. Surveying
   - by Aziz & Shahjahan
2. Surveying, Volume-2
   - by Dr.K.R. Arora
3. Hydrograpy for the surveyor and engineer
   - by V.J ABBOTT

67872 Mine Surveying

T P C

2 3 3

AIMS

- To be able to locate the position of under ground galleries, main roads and air passages.
- To able to choose the best side for installing machinery for hauling purposes.
- To be able to know the arrangements for providing ventilation and drainage.
- To able to locate the position of faults vein for located minerals.
- To be able to demarcate workable and non-workable portion.
- To be able to determine the levels and heights of underground beds for mining shafts.
- To be enable to setting out underground tunnel.
- To be able to conduct triangulation adjustment.
- To be able to determine the geodetic position of a place.

SHORT DESCRIPTION

Mine survey; safety practice; Tunnel survey; Mine survey equipment; preparation of tunnel center line, Method of lay-out the center line of tunnel; Process of transferring the center line; Sources of difficulties & errors; Terms & laws used in triangulation adjustment; Values of quantities; Station adjustments; Figure adjustment Computation of geodetic position with total station and GPS.

DETAIL DESCRIPTION

Theory:

1 Understand the concept of mine survey.

1.1 Describe the purpose of mine survey.

1.2 Describe safety measure for mine survey.

1.3 Describe the series of work involved in mine survey.

1.4 List the instruments required in mine survey.

1.5 Describe the problems and difficulties in mine survey.

1.6 Describe the following terms in mine survey:

a) Ventilation in tunnel. c) Tunnel transit.

b) Mining shaft. d) Tunnel on curve.

e) Station and station marks. f) Illumination.

2 Understand the method of tunnel survey.

2.1 State the meaning of tunnel.

2.2 Describe the points to be considered for location of tunnel.

2.3 List the instruments required for setting out tunnel.

2.4 Describe survey works required for tunnel.

2.5 Explain the following terms related to tunnel survey:

a) Surface survey. c) Surface alignment.

b) Exact alignment. d) Grade in the tunnel.

3 Understand the features of mine survey equipment or instruments.

3.1 List the equipment and accessories required for mine survey.

3.2 Explain the following :

a) An auxiliary telescope b) Tunnel station

c) Suspension mining compass d) Braunton’s universal pocket compass.

e) Correction fore side Telescope horizontal angle

4 Understand the method of laying out center line of a tunnel.

4.1 Describe the method of laying out center line of a tunnel.

4.2 List of instruments used in laying out center line of tunnel.

4.3 Describe the method of setting out center line of the tunnel from the ends.

4.4 Describe the connection method of the surface and under ground survey.

4.5 Describe the method of setting the center line down from the vertical shaft.

4.6 Compute bearing of a drift & compute Co-ordinate of a drift with G.P.S.

5 Understand the process of transferring the center line down the shaft.

5.1 Define shaft.

5.2 Describe the necessity of transferring the center line down the shaft.

5.3 List of instruments required for transferring the center line down the shaft.

5.4 Describe the method of transferring the center line from the surface to the bottom of shaft.

5.5 Mention the purpose of BM for levelling operation in a tunnel.

5.6 Describe the method of transferring the levels under ground.

6 Understand the sources of difficulties and errors encountered in tunneling.

6.1 Identify the sources of error and difficulties in tunneling.

6.2 Measure and difficulties of a deep shaft.

6.3 Describe the procedure of arranging sight marks.

6.4 Describe the way to avoid difficulties and errors in tunneling.

7 Understand various terms and laws used in triangulation adjustment.

7.1 Describe the following terms:
independent quality, conditional quality, observation, direct observation, weight of an observation, observed value of a quality, true value of a quality, most probable value of quality, true error, residual error, observation equation, reduced observation equation, conditional equation, normal equation.

7.2 Describe the laws of weights.

7.3 Describe the rules to be employed in the adjustment of field observation.

7.4 Describe the station adjustment and summation adjustment.

7.5 Describe the station adjustment, when the horizon is closed with angles of equal weight and unequal weights.

7.6 Solve problems related to station adjustments.

8 Understand the determination of most probable values of quantities.

8.1 Describe direct observation of equal weight (or precision).

8.2 Describe the direct observation of unequal weight (or precision).

8.3 Describe indirect observation on independent quantities (of equal weight).

8.4 Describe indirect observation on independent quantities (of unequal weight).

8.5 Describe the most probable values of conditioned quantities.

8.6 Solve problems.

9 Understand the probable error.

9.1 Define probable error.

9.2 Determine the probable error by direct observation of equal weight.

9.3 Determine the probable error by direct observation of unequal weight.

9.4 Determine the probable error by indirect observation on independent quantities.

9.5 Determine the probable error by indirect observation involving condition equation.

9.6 Determine the probable error by computed quantities. (case-1,case-II and case–III).

9.7 Solve problems.

10 Understand the figure (triangle) adjustment.

10.1 Describe the rules for correction to the observed angles.

10.2 Describe the procedure of plane triangle adjustment.

10.3 Describe spherical excess.

10.4 Describe the computation of the sides of a spherical triangle:

a) by spherical trigonometry. b) by Delambre's method. c) by Lagendre's method.

10.5 Describe the adjustment of two connected triangle.

10.6 Solve problems.

11 **Understand the computation of geodetic position.**

11.1 Describe the effect of curvature of the earth on geodatic survey.

11.2 Describe the convergence of meridian.

11.3 Describe the deduction formula for determining the convergence of meridian.

11.4 Determine the longitude of a place by triangulation.

PRACTICAL:

1. Select and measure the base line.
2. Determine the corrected length of base line.
3. Measure the horizontal angles of the triangulation survey.
4. Determine the unknown length of the triangles of triangulation survey.
5. Determine the values of error in triangulation adjustment.
6. Perform the triangulation adjustment for the error.

REFERENCE BOOKS

1. Surveying and Levelling Vol-II
   - by T P Kanethker.
2. A Text Book of Surveying Vol-II
   - by P B Shahani.
3. Surveying Theory and Practics
   - by E. DAVIS S. Foote W. Kelly
4. Surveying Vol-II
   - by Dr. B. C. Punmia.

5 Surveying Vol-II
   - by Dr. K. R. Arora

67873 Surveying Project T P C
0 6 2

1. Prepare topographical map on scale 1 : 10000 after providing control point with Theodolite/Total Station and G.P.S.
2. Prepare Hydrographic Chart on Scale 1:1000,1:50000 by digital hydrographic charting system.
3. Prepared Earth volume graph by digital method (Level machine/Total station/GIS).
4. Determine true north by observing polaries.
5. Determine global position of Road/Tunnel/Flyover/Bridge, centre line and alignment by G.P.S.
6. Conduct route survey of a Road or Canal by G.P.S. and setting out points for tree plantation in Road/Canal/River side.
7. Compute dredge volume using Arc GIS tool including channel design & dredging alignment.
8. Visit RHD /BIWTA/BWDB/PWD/LGED/Settlement office and submit a report on the preparation & maintenance of records of right.

REFERENCE BOOKS

1. A Text Book of Surveying Vol-II
   - by P B Shahani.
2. Surveying Vol-II
   - by Dr. K. R. Arora.
3. Surveying Vol-II
   - by Dr. B. C. Punmia.
4. Surveying Theory and Practics
   - by E. DAVIS S. Foote W. Kelly.

66473 Transportation Engineering – 2 T P C

2 3 3

AIMS

- To be able to understand the components of railway track, bridge & culvert, stations & yards and assess important requirements and functions of each.
- To be able to understand the curves used in railway track and assess the limiting radii.
- To be able to understand the control system of railway track and assess their importance.
- To be able to understand the maintenance, service and repair procedures, methods and technique used to keep the railway operational.

SHORT DESCRIPTION

History of railway; Railway surveys; Permanent way; Rail fastening; Sleeper; Ballast; Creep; Station and yard; Points and crossings; Signaling; Railway bridges, culverts and Tunneling; Maintenance of railway; Harbor and Port.

DETAIL DESCRIPTION

Theory:

1. Understand the history of railway and railway surveys.

1.1 Describe a brief history of railways.
1.2 Mention the characteristics of railways.
1.3 Mention the Advantages of Railway over highways.
1.5 Mention the objectives of railway surveys.
1.6 Describe the importance of reconnaissance survey for railways.
1.7 Describe the process of preliminary survey for railways.
1.8 Describe in details the final location survey for railways.
1.9 Describe the future of railways in Bangladesh.

2. Understand the permanent way.

2.1 State the requirements of permanent way.
2.2 Describe rail, rail gauge, and dual gauge.
2.3 Mention the requirements of an ideal rail.
2.4 Mention the advantages different types of rail gauge used in Bangladesh.
2.5 Illustrate weight and section of rail.
2.6 Explain the methods of rectifying damaged rail.
2.7 Mention the points that govern the length of rail.
2.8 State the methods to be adopted to reduce wear of rail.
2.9 Mention the precautions to be taken to prevent buckling of rail.
2.10 Illustrate the advantages and disadvantages of coning of wheel.

3. Understand the concept of rail fastening.

3.1 State the meaning of rail fastening.
3.2 Mention the requirements of an ideal rail fastening.
3.3 Mention different types of rail joint.
3.4 Mention the characteristics of an ideal rail joint.
3.5 State the bearing plate, fish plate, spikes, hook bolt, fang bolt, Chair and keys.
3.6 Mention the advantages and disadvantages of welding rail.

4. Understand the concept of using sleeper in permanent way.

4.1 Describe and functions of railway sleeper.
4.2 Mention the requirements of an ideal sleeper.
4.3 Mention the different types of sleeper.
4.4 Mention the advantages and limitations of timber sleeper.
4.5 Mention the advantages and limitations of steel sleeper.
4.6 Mention the advantages and limitations of concrete sleeper.
4.7 Explain the density of sleepers.

5. Understand the concept of using ballast in permanent way.

5.1 Describe and functions of ballast.
5.2 Mention the characteristics of good ballast.
5.4 Describe the materials used as ballast with their advantages and disadvantages.
5.5 State the meaning of depth of ballast.
5.6 Specify the size of good quality ballast.
5.7 State the necessity of screening of ballast.
5.8 Describe the process of screening of ballast.
5.9 Describe the quantity of ballast needed for construction of permanent way.

6. Understand the concept of creep, super elevation on curves in railway.

6.1 State the meaning of creep in rail.
6.2 Mention the causes of creep in permanent way
6.3 Describe the factors which affect the super elevation in a railway track.
6.4 Calculate the quantity of super elevation in a railway track.
6.5 Define cant deficiency, equilibrium cant, negative cant and cant gradient.
6.6 Explain the speed of train on curve.
6.7 List the procedure for finding respective speeds on main line and branch line.
6.8 Describe the procedure of measuring the amount and correcting of creep.

7. Understand the concept of station and yard.

7.1 Define railway station, wayside station and railway yard.
7.2 Mention the purposes of a railway station.
7.3 Mention different types of railway station.
7.4 Describe the features of a railway station.
7.5 Describe the points to be considered for selecting the site of a railway station.
7.6 Describe different types of railway yard.
7.7 Describe different types of platform used in railway.
7.9 Differentiate between junction and terminal.

8. Understand the concept of points and crossings.

8.1 Define points and crossings.
8.2 Mention the purposes of points and crossings.
8.3 Define the terms: switch, tongue rail, check or guard rail, stock rail, stretcher bar, throw of switch, fouling mark, right hand switch and left hand switch.
8.4 Describe the method of laying sleepers for points and crossings.
8.5 Describe the meaning of clearance and switch angle.
8.6 Describe types of crossing.
8.7 Define the terms: crossing clearance, crossing number and crossing angle.
8.8 Mention the advantages and disadvantages of level crossing.

9. Understand the aspects of signaling in railways.

9.1 Explain the importance of signaling in railways.
9.2 Describe different types and typical layout of signal.
9.3 Discuss the control of movement of trains.
9.4 Describe the pilot guard system and centralize traffic control system.
9.5 Describe automatic signaling.
9.6 State the meaning of interlocking.
9.7 Mention the essential principles of interlocking.

10. Understand the features of Railway Bridge, Culvert and Tunneling in railways.

10.1 Describe the major components of a railway bridge, culvert and tunnel.
10.2 Define the terms: span, flood discharge, waterway, and scour depth, depth of foundation, afflux, clearance and free board.
10.3 Mention different types of Railway Bridge, culvert and tunnels.
10.4 Mention the points to be considered in locating the site for a railway bridge and culvert.
10.5 Mention the purpose and development of railway tunnels.
10.6 Describe the favorable condition, advantages and limitation of tunnels.
10.7 Mention the advantages of underground railways and overhead railway.
10.8 Define metro rail and purpose of metro rail in Bangladesh.
10.9 Describe the advantage and limitation of metro rail.

11. Understand the concept of maintenance work in railway.

11.1 Explain the necessity for maintenance work in railway.
11.2 Mention the advantages of good track maintenance.
11.3 Describe the duties of gang mate, key man and permanent way inspector (PWI) in the maintenance work.
11.4 Describe the process of maintenance work of rolling stock and boxing of ballast.
11.5 Mention the causes of accident in a railway track.
11.6 Describe the process of signaling during maintenance work.
11.7 List the name of tools required for maintenance work.
11.8 Describe the process of packing of ballast in a railway track.
11.9 Explain the importance of inspection of rails and the process of inspection of track.

12. Understand the basic concept of harbor and port.

12.1 State the meaning of harbor and port.
12.2 Mention the purposes and utility of harbor and port.
12.3 Mention different types of harbor and port.
12.4 Mention the suitable location for harbor and port.
12.5 Describe the following terms: natural harbor, semi-natural harbor, artificial harbor, military harbor, commercial harbor, port of entry, ocean port, inland waterway port, free port, and anchorage area, marine terminal and turning basin.
12.6 Mention the points to be considered in selecting the site for a port.

PRACTICAL:

1. Draw the section of a permanent way showing the components.
2. Draw the sketches of double headed rail, bull headed rail and flat footed rail with measurements.
3. Draw the sketches of narrow gauge, meter gauge, broad gauge and dual gauge used in Bangladesh showing the measurements.

4. Draw the sketches of fish plate, bearing plate, dog spike, screw spike, round spike and elastic spike with measurements.
5. Draw the sketches of different types of sleepers used in Bangladesh.
6. Draw the sketches of wayside station, yard, junction and terminals showing platform and other components.
7. Draw the sketches of main track and side track of a double line railway station.
8. Draw the sketches of a level crossing, points and crossing showing all components.
9. Draw the sketches of acute crossing, double crossing, square crossing and diamond crossing.
10. Visit to a nearby station to see the different components of a railway station, harbor and port and submit a report.

REFERENCE BOOKS

1. Railway Engineering - S C Rangwala
2. Railway Engineering – B L Gupta and Amit Gupta
3. Marine Structure and Port Facilities – Quinn
4. Internet

66474 Design of Structure – 2 T P C
2 3 3

AIMS

- To be able to select suitable reinforcement and section required for reinforced cement concrete solid floor / roof slab.
- To be able to select suitable reinforcement and section required for reinforced cement concrete column.
- To be able to select suitable reinforcement and section required for reinforced cement concrete stair slab.
- To be able to select suitable reinforcement and section required for reinforced cement concrete footing for brick wall and reinforced cement concrete wall.
- To be able to select suitable reinforcement and section required for reinforced cement concrete column footing.
- To be able to select suitable reinforcement and section required for reinforced cement concrete cantilever retaining wall.
- To be able to supervise the placement of reinforcement for all types of reinforced cement concrete works.
- To be able to acquire preliminary knowledge about pre-stressed concrete.

SHORT DESCRIPTION

Design of reinforced cement concrete one-way & two-way slab, stair slab, column, wall footing, column footing and cantilever retaining wall; Pre-stressed concrete and Miscellaneous RCC structures.

DETAIL DESCRIPTION

Theory:

1. Understand the concept of floor/roof slab.

1.1 Describe different types of reinforced cement concrete floor/roof slab.
1.2 State the loads to be considered in designing reinforced cement concrete floor slabs.
1.3 State the way to determine the dead load and live load.
1.4 Compare between one-way and two-way solid reinforced cement concrete slab.

2. Understand the principles of designing reinforced cement concrete one-way solid slab.

2.1 State the minimum thickness of reinforced cement concrete one-way slab.
2.2 Explain the necessity of shrinkage and temperature reinforcement in one-way slab.
2.3 Mention the steps to be followed in designing reinforced cement concrete one-way slab.
2.4 Design reinforced cement concrete one-way slab with supplied data in both WSD and USD methods.
2.5 Design a reinforced cement concrete cantilever slab in WSD method.
2.6 Design a one-way reinforced brick (RB) slab in WSD method.
2.7 Calculate the load carrying capacity of a one way slab with supplying data.

3. Understand the principles of designing reinforced cement concrete two-way slab.

3.1 State the minimum thickness of reinforced cement concrete two-way slab.

3.2 Explain the use of bending moment coefficient in designing reinforced cement concrete two way slab.
3.3 State the meaning of column strip and middle strip in two-way slab.
3.4 Design reinforced cement concrete two-way slab with supplied data in WSD method.
3.5 Explain the necessity of corner reinforcement in two-way slab.
3.6 Design a reinforced cement concrete balcony slab in WSD method.
3.7 Calculate the load carrying capacity of a two way slab with supplying data.

4. Understand the principles of designing reinforced cement concrete stair slab.

4.1 List various types of stair.
4.2 Mention the relation between tread and rise according to American standard and BNBC.
4.3 State the formula used in calculating weight of waist slab and steps.
4.4 Design reinforced cement concrete stair slab in WSD method.

5. Understand the principles of designing reinforced cement concrete Axially Loaded columns.

5.1 Describe different types of reinforced cement concrete column.
5.2 State the minimum size and minimum number of rod required for tied column and spiral column.
5.3 Explain the effective length of column.
5.4 Describe reduction factor of column.
5.5 Determine the spacing of lateral ties and spirals of column.
5.6 Determine the safe load on column (by using table).
5.7 Design a reinforced cement concrete tied column.
5.8 Design a reinforced cement concrete spiral column.

6. Understand the principles of designing reinforced cement concrete footing.

6.1 Determine the width of foundation bed of spread footing and RCC wall footing.
6.2 Describe the critical section for moment, shear and bond of brick wall footing and concrete wall footing.
6.3 Design a reinforced cement concrete footing for brick wall.
6.4 Describe the critical section for moment, shear and bond of concrete column footing.
6.5 Design the independent reinforced cement concrete square and rectangular column (blocked) footing.
6.6 Design the independent reinforced cement concrete square and rectangular column (sloped) footing.
6.7 Design of a combined footing.

7. Understand the principles of designing reinforced cement concrete cantilever retaining wall.

7.1 Describe the different component of a cantilever retaining wall.
7.2 Calculate the earth pressure related to cantilever non-surcharged retaining wall.
7.3 Find out the position of the resultant pressure of weight of retaining wall and earth pressure for non-surcharged retaining wall.
7.4 Explain the factors affecting the stability of cantilever retaining wall.
7.5 Determine the maximum and minimum pressure on the foundation bed due to different condition of eccentricity.
7.6 Design a reinforced cement concrete cantilever non-surcharged retaining wall.
7.7 Check the stability of cantilever non-surcharged retaining wall.

8. Understand the concept of pre-stressed concrete.

8.1 Define pre-stressed concrete.

8.2 Compare the advantages and limitations of reinforced cement concrete and pre-stressed concrete.
8.3 Describe the properties of concrete used for pre-stressed concrete.
8.4 Describe the properties of steel strand used for pre-stressed concrete.
8.5 Describe the procedure of pre-stressing the wire/tendon pre-tensioning.
8.6 Describe the procedure of pre-stressing the wire/tendon post-tensioning.
8.7 Mention the uses of pre-stressed concrete in Bangladesh.

9. Understand the typical drawing of miscellaneous reinforced cement concrete structure.

9.1 Explain the Re-bar placement of the following structures:

a. Raft/Mat foundation
b. Combined footing and cantilever footing
c. Pile with pile cap
c. Basement floor
d. Column and Beam Connection
e. Two-span box culvert
f. Bridge deck slab of T-beam
g. Counterfort retaining wall
h. Flat slab & Flat plate slab
i. Ramp
j. Helical stair slab
k. spiral stair slab
l. Overhead water tank of rectangular and dome shaped.
m. Under ground water reservoir of square, rectangular and circular shape.

PRACTICAL:

1. Prepare a model of one-way slab reinforcement as per drawing (simply supported/Semi-continuous/Fully continuous).
2. Prepare a model of cantilever slab reinforcement as per drawing.
3. Prepare a model of two-way slab reinforcement as per drawing.
4. Prepare a model for RCC stair slab reinforcement as per drawing.
5. Prepare a model of square/rectangular tied column with footing as per drawing.
6. Prepare a model of spiral column with footing as per drawing.
7. Prepare a model for RCC wall footing as per drawing.
8. Prepare a model for cantilever retaining wall as per drawing.

Note-1: Step to be followed:

* Collect the MS rod.
* Straight the MS rod.
* Cut the MS rod in required length.
* Remove the rust of the rod if any.
* Bend the MS rod as required.
* Make hooks according to design code.
* Arrange the main rod and binder rod.
* Bind each of the joints with galvanized iron wire.
* Check the properness of the fabrication works.

9. Class teacher may arrange a field/industry visit to see the practical reinforcement fabrication works of any RCC structure or any construction project.

Step to be followed:

* Make suitable groups of student.
* Collect video camera.
* Take necessary photograph.
* Make a report and present by multimedia projector.
* Open discussion among the student of others groups.

REFERENCE BOOKS

1 Design of Concrete Structure - Winter, Urquahert and Nelson
2 Treasure of RCC - Shushil Kumar
3 Design of RCC Structure - Abul Faraz Khan
4 Simplified Design of Reinforced Concrete - H Parker

68873 Construction Management & Documentation

T	P	C
2	3	3

AIMS:

- To be able to understand the modern techniques of construction management.
- To be able to understand the operational research & site layout and organization.
- To be able to understand the mobilization of materials in construction management.
- To be able to understand the quality and cost control.
- To be able to understand the Pre-tender and Post-tender planning.
- To be able to prepare pre-qualification documents.
- To be able to evaluate pre-qualification documents.
- To be able to prepare technical specifications.
- To be able to prepare financial evaluation.
- To be able to prepare contract clauses.
- To be able to prepare tender documents.
- To be able to prepare contract documents.
- To be able to prepare Quality control document.
- To be able to understand the cost control.
- To be able to develop knowledge, skill and attitude of evaluating tenders and preparing comparative statement.

SHORT DESCRIPTION

Principles of management and construction; Organization of contracts department; Operational research; Site layout and organization; Mobilization of materials; Demobilization of STRUCTURE; Safety in construction; Quality and cost control; Codes and building by-laws; Tender; Pre-tender and Post-tender planning; Tender document; Tender notice; Instruction to tender; Contract clauses/condition of contract; Technical specifications of materials and works; Pre-qualification of contractors; Evaluation and comparative statement; Contract agreement.

DETAIL DESCRIPTION

Theory:

1. **Understand the principles of management and construction.**
   - 1.1 Define management.
   - 1.2 State the functions of management.
   - 1.3 Describe the planning and executive functions of management.
   - 1.4 Define construction management.
   - 1.5 Establish the relation between management. and construction management.
   - 1.6 Explain the necessity for scientific management in construction process.
   - 1.7 Describe the role of an engineer as a construction manager.
   - 1.8 List the organs of project management team (PMT).
   - 1.9 State the main objectives of a project management team.

2. Understand the organization of contracts department.

2.1 Define organization.
2.2 Describe organizational effectiveness in an organization.
2.3 State the staffing pattern in an organization of contract department.
2.4 Draw an organizational chart of a contracts department.
2.5 Describe the responsibilities and authorities of the components of contracts Department.
2.6 List different government engineering department in Bangladesh.
2.7 Explain the role and responsibilities of the following within the engineering Organization: i) Chief Engineer (CE), ii) Additional Chief Engineer (ACE), iii) Superintending Engineer (SE), iv) Executive/Divisional Engineer (XEN/DE), v) Sub-Divisional Engineer (SDE), vi) Asstt. Engineer (AE), vii) Sub-Asstt. Engineer(SAE), viii) Work Supervisor/Work Assistant.
2.8 Explain the need for relation and co-operation between site engineer and contractor's agent.
2.9 Describe the relation between-a. Site office and Head office, b. Contractor and Head office
2.10 Define consultancy services.
2.11 State the conditions for enlistment of consulting firm.
2.12 Describe the function and objectives of consultants.

3. Understand the operational research in construction management process.

3.1 Define operational research.
3.2 Explain construction stage, construction operation and construction schedule.
3.3 Describe the budget and flow-chart of money and materials.
3.4 Explain the method of calculating project time schedule.
3.5 Describe bar chart and its shortcoming and remedies.
3.6 State the necessity of network planning.
3.7 Classify network planning.
3.8 Describe the procedure construction network.
3.9 Define critical path method (CPM) and project evaluation & review technique (PERT).
3.10 Describe the process of construction CPM network.
3.11 Describe the process of drawing a PERT network.
3.12 State advantages of CPM and PERT network.
3.13 Distinguish between CPM and PERT network.
3.14 Describe the preparation of CPM and PERT network for a 6-storiedbuilding project.
3.15 Explain the following terms:
a. Event
b. Activity
c. Duration
d. Dummy activity
e. Total float
f. Free float

4. Understand the site layout and mobilization of materials in construction management.

4.1 State different features of a site layout plan.
4.2 Draw a site layout plan of a construction site organization.
4.3 Explain the importance of site security.
4.4 Define mobilization of materials and equipment.

4.5 Explain the procedure of receiving materials on site.

4.6 Draw a line plan of a material warehouse within the site.

4.7 Explain the procedure of removing materials from the site.

5. Understand the safety measures to be taken in construction management.

5.1 Define safety measure.

5.2 State the nature of accidents in construction work.

5.3 Describe objectives, application and policy planning of safety program in construction work.

5.4 Draw a typical organization chart for safety group.

5.5 Describe the responsibility of employers and employees in respect of safety measure.

5.6 State the general safety requirements in construction works.

5.7 State different signals, signs and tags used in safety work.

5.8 Describe necessary safety measure in working field. Such as - material handling, storage and disposal, handling of machinery and mechanical equipment and operating motor during work in the outer edge of a structure.

5.9 Explain the necessity of safety training for employees.

5.10 Explain the process of preparation of accident report.

5.11 Prepare an accident report to the employer.

6. Understand the quality control and cost control process in construction management.

6.1 Define quality control and cost control.

6.2 Describe the effects of lack of adequate quality control.

6.3 State the effects and benefit of quality control for the contractor, the designer and consultants.

6.4 Draw a flow diagram of a quality plan.

6.5 Describe the responsibilities to control the quality of construction of a) the client, b) the designer, c) the manufacturer, d) the contractor and f) the supervisor.

6.6 Mention the requirements for an effective cost control system.

6.7 State the phases of a management cost and control system.

6.8 Mention the procedural steps of management cost control system (MCCS).

6.9 Explain cost reduction cycle.

7. Understand the concept of tender, codes and building by-laws in practice.

7.1 Define tender or bid.

7.2 Mention different types of tender.

7.3 State the meaning of local competitive bid (LCB) and international Competitive bid (ICB).

7.4 Mention different building codes used in Bangladesh

7.5 Mention building by-laws practiced in the country.

8. Understand the pre-tender and post-tender planning.

8.1 Define pre-tender planning.

8.2 State the objectives of pre-tender planning.

8.3 List the activities of pre-tender planning.

8.4 Define post-tender planning.

8.5 List the activities of post-tender planning.

8.6 Explain anticipation of award.

8.7 Define evaluation of contract.

8.8 Explain the silent features of evaluation. of contract.

9. Understand the concept of tender documents.

9.1 State the meaning of tender document

9.2 Mention the characteristics of ideal tender document

9.3 Describe the procedure of preparation of tender document.

9.4 Explain different methods of contract for works.

9.5 Explain the following Contents of the tender documents:

- Tender Notice
- Instruction to Tenderers (ITT)
- Bill of Quantities (BOQ)
- Construction time period
- Tender Form
- Form of Agreement
- General Conditions of Contract (GCC)
- Special Conditions of Contract (SCC)
- Technical specifications
- Date of Site Possession and Mobilization
- Period of commencement of work
- Period of Completion
- Security deduction
- Liquidated damages and penalty for delay in completion of the work
- Condition of engagement of a sub-contractor.
- Quality control clauses
- Time schedule of work
- Day-work
- Arbitration
- Extension of completion period
- Termination
- Maintenance period

10. Understand the meaning of tender notice.

10.1 Define tender notice.

10.2 Mention different types of tender notice.

10.3 Mention the particulars needed for a tender notice.

10.4 State the meaning of comparative statement.

10.5 Mention the advantage of preparing comparative statement.

10.6 Define pre-bid meeting.

11. Understand the Instruction to Tenderers (ITT).

11.1 Interpreter the following terms used in ITT:

(a) Scope of Tender

(b) Source of Funds

(c) Eligible Bidders

(d) Qualification of the Bidder

(e) Amendment of Tender Documents

(f) Language of Tender

(g) Documents Comprising the Tender

(h) Tender Prices

(i) Currencies of Tender and Payment
(j) Tender Validity
(k) Tender Security
(l) Format and Signing of Tender
(m) Sealing and Marking of Tenders
(n) Deadline for Submission of Tenders
(o) Late Tenders
(p) Modification and Withdrawal of Tenders
(q) Tender Opening
(r) Evaluation of Contract
(s) Force major
(t) Earnest money/ Tender Security
(u) Award Criteria
(v) Performance security.

12. Understand the pre-qualification of contractors.

12.1 Define pre-qualification of contractors.
12.2 Describe the aim of prequalification of contractors
12.3 State the features of prequalification notice
12.4 Describe the procedure of preparation of pre-qualification Document.
12.5 Mention the prequalification criteria
12.6 Explain the procedure of preparation of evaluation criteria of pre-qualification document
12.7 Describe the process of evaluation of prequalification applications submitted by the intending contractors

13. Understand the evaluation and Comparative Statement of Tenders

13.1 Describe the tender opening procedure including preparation of opening memo.
13.2 Explain the process of examination of tenders and determination of responsiveness
13.3 Explain the process of evaluation and comparison of tenders.

14. Understand the Concept of e-tendering.

14.1 Define e-tender.
14.2 Describe the purpose of e-tender
14.3 Mention the advantage and disadvantage of e-tender
14.4 Describe the process of preparing e-tender.
14.5 Describe the importance of e-tendering in Bangladesh.

15. Understand the recent public procurement rules(PPR) implemented by the govt. of Bangladesh

15.1 State the back ground of PPR development in Bangladesh.
15.2 State the meaning of the following: PPR, PPA, ITT, TDS, GCC, PCC, NOA, BOQ, TOC, POC, TEC, PEC, HOPE, CS, OTM, RFQ, DPM, and CPTU.
15.3 Describe the preparation of standard tender document for works.
15.4 Describe the preparation of standard tender document for goods.
15.5 Describe the process of tender submission.
15.6 Describe the process of evaluation of tender documents.

PRACTICAL:

1. Draw a neat sketch of a construction site showing different components.
2. Prepare a construction schedule of a 6-storied residential building.
3. Prepare a CPM network for a given data.
4. Prepare a PERT network for a given data.
5. Prepare a PCP of 6-storied building project for a given data.
6. Prepare an accident report for an accident to the employer.
7. Prepare a tender notice for a particular work.
8. Prepare a tender document for particular work.
9. Prepare a pre-qualification document for contractor selection (particular work).
10. Prepare a comparative statement for particular bid.
11. Write a notification of award.

REFERENCE BOOKS

1 Introduction to Building Management (Fifth Edition) - RE Calvert

3 Construction Management (Second Edition) - PP Dharwadker

4 The Site Agents Hand Book - RHB Ranns

5 Building Organization & Procedures (Second Edition) - G Froster

6 Building Production and Project Management - R A Burgess and G White

7 The Resume of Building Construction & Management with CPM (Construction Concept) - Mohammed Ali Siddiquee

65853 **INNOVATION & ENTREPRENEURSHIP**

T	P	C
2	0	2

AIMS

- To be able to understand the concept of entrepreneurship & entrepreneur.
- To be able to understand the concept of environment for entrepreneurship.
- To be able to understand the sources of venture ideas in Bangladesh.
- To be able to understand the project selection.
- To be able to understand business planning.
- To be able to understand the insurance and premium.
- To be able to understand the MDG & SDG.

SHORT DESCRIPTION

Concepts of entrepreneurship & entrepreneur; Entrepreneurship & economic development; Environment for entrepreneurship; Entrepreneurship in the theories of economic growth; Sources of ventures ideas in Bangladesh; Evaluation of venture ideas; Financial planning; Project selection; Self employment; Entrepreneurial motivation; Business plan; Sources of assistance & industrial sanctioning procedure; Concept of SDG; SDG 4,8 .

DETAIL DESCRIPTION

Theory :

1. Understand the basic concept of entrepreneurship & entrepreneur.

1.1 Define entrepreneurship & entrepreneur.
1.2 Discuss the characteristics and qualities of an entrepreneur.
1.3 Mention the classification of entrepreneur.
1.4 Discuss the necessity of entrepreneurship as a career.
1.5 Discuss the prospect of entrepreneurship development in Bangladesh.

2. Understand the concept of entrepreneurship and economic development.

2.1 Define economic development.
2.2 Discuss the economic development process.
2.3 Discuss the capital accumulation or rate of savings.
2.4 Discuss the role of entrepreneur in the technological development and their introduction into production Process.
2.5 Discuss the entrepreneur in the discovery of new product.
2.6 Discuss the discovery of new markets.

3. Environment for entrepreneurship development:

3.1 Define the micro environment.
3.2 Discuss individual income, savings and consumption.
3.3 Define macro environment.
3.4 Discuss political, socio-cultural, economical, legal and technological environment.
3.5 Difference between micro and macro environment .

4. Understand the concept of entrepreneurship in the theories of economic growth.

4.1 Define entrepreneurship in the theories of economic growth.
4.2 Discuss the Malthusian theory of population and economic growth.
4.3 Discuss the stage theory of growth.
4.4 Discuss the Schumpeterian theory of economic development.
4.5 Discuss the entrepreneurship motive in economic development.

5. Understand the sources and evaluation of venture ideas in Bangladesh.

5.1 Define sources of venture ideas in Bangladesh.
5.2 Discuss different types of sources of venture ideas in Bangladesh.
5.3 Define evaluation of venture ideas.
5.4 Discuss the factors that influence the selection of venture idea.

6. Understand the concept of project selection and financial planning.

6.1 Define project.
6.2 Discuss the idea of project.
6.3 Describe the guide lines for project ideas.
6.4 Discuss the sources of project ideas.
6.5 Discuss the evaluation of project ideas.
6.6 Describe the technical aspect of project.
6.7 Define financial planning.
6.8 Discuss the long term financial plan.
6.9 Discuss the short term financial plan.

7. Understand the concept of self employment.

7.1 Define self employment.
7.2 Describe different types of employment.
7.3 Describe the importance of business as a profession.
7.4 Discuss the reasons for success and failure in business.

8. Understand the business plan and the concept of the environment for entrepreneurship.

8.1 Define business plan.
8.2 Describe the importance of business plan.
8.3 Discuss the contents of business plan.
8.4 Define environment of business.
8.5 Describe the factors which effect environment on entrepreneurship

9. Understand the concept of sources of assistance & industrial sanctioning procedure.

9.1 Define sources of assistance.
9.2 Describe different types of sources of assistance.
9.3 Discuss the aid of sources.
9.4 Discuss the industrial policy.
9.5 Define foreign aid.

10. Understand the insurance and premium.

10.1 Define insurance and premium
10.2 Describe the essential conditions of insurance contract.
10.3 Discuss various types of insurance.
10.4 Distinguish between life insurance and general insurance.

11. Understand the concept of Sustainable Development Goals (SDG)

11.1 Define Sustainable development
11.2 State UN targets of MDG
11.3 State UN targets of SDG
11.4 Describe the importance of SDG
11.5 Explain the objectives of SDG
11.6 State the Challenges to achieve SDGs
11.7 Explain the actions to face the challenges of SDGs
11.8 State the of 7^{th} 5 years plan
11.9 Mention the link of 7^{th} 5 years plan with SDGs
11.10 Write down the 5 ps of sustainable development goals

12. Understand SDG 4,8 and 17

12.1 Describe SDG 4 and its targets

12.2 State the elements of Quality education for TVET

12.3 Describe the gender equality and equal access of TVET for economic growth

12.4 Describe SDG 8 and its targets

12.5 Explain Green development, Green Economy, Green TVET & Green Jobs

12.6 Explain the role an entrepreneur for achieving SDG

Reference book :

1. A hand book of new entrepreneur-by p.c jain.
2.A manual on business opportunity Identification and selection-by j.B patel and S S modi.
3.Uddokta unnoyan Nirdeshika -Md.Sabur khan.
4.Entrepreneurship- bashu and mollik.
5.Business Entrepreneurship-kage faruke.
6. Website, Youtube and Google