

4-YEAR DIPLOMA IN ENGINEERING PROGRAM

# **CONSTRUCTION TECHNOLOGY**

SYLLABUS  
(COURSE STRUCTURE-2010)

SEVENTH & EIGHTH  
SEMESTER

## CONSTRUCTION TECHNOLOGY (88)

7<sup>th</sup> 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	8871	Construction Methodology-4	3	3	4	30	120	25	25	200
2	8872	Construction Engineering Project	0	6	2	-	-	50	50	100
3	8873	Construction Management & Documentation	3	3	4	30	120	25	25	200
4	6474	Design of Structure -2	3	3	4	30	120	25	25	200
5	6473	Transportation Engineering-2	2	3	3	20	80	25	25	150
6	6472	Environmental Engineering-2	2	3	3	20	80	25	25	150
7	5853	Entrepreneurship	2	0	2	20	80	-	-	100
<b>Total</b>			<b>15</b>	<b>21</b>	<b>22</b>	<b>150</b>	<b>600</b>	<b>175</b>	<b>175</b>	<b>1100</b>

## CONSTRUCTION TECHNOLOGY (88)

8<sup>th</sup> 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	8881	Industrial Training			6			180	120	300
<b>Total</b>					<b>6</b>					<b>300</b>

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### SEVENTH SEMESTER

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4-YEAR DIPLOMA IN ENGINEERING PROGRAM

# **CONSTRUCTION TECHNOLOGY**

**SYLLABUS  
(COURSE STRUCTURE-2010)**

**SEVENTH SEMESTER**

**8871 CONSTRUCTION METHODOLOGY - IV**  
**T P C**  
**3 3 4**

**AIMS**

- To be able to develop knowledge, skill and attitude of the operation and maintenance of construction equipment.
- To be able to understand the construction process & function of pre cast building components.
- To be able to understand the low cost housing.
- To be able to understand Ferro Cement element.
- To be able to understand the waffle slabs or joist slabs.
- To be able to understand about drainage system.
- To be able to understand the hollow block.
- To be able to understand the arch system.
- To be able to understand external site development.
- To be able to understand the construction maintenance works.
- To be able to understand the supervision construction maintenance works.

**SHORT DESCRIPTION**

Construction equipment; Precast building components (Precast RCC pipes, fashion blocks, posts, sanitary rings and slabs); Low cost housing; Ferro Cement water tank; Ferro Cement sloping roof; Ferro cement roof channel; Retaining wall, waffle slabs or joist slabs; Drainage system; hollow block; Arch system; Site development and landscaping; Fountains; Flower base and Ornamental stairs; Construction maintenance works and supervision.

**DETAIL DESCRIPTION**

**Theory:**

- 1 Understand the necessity of equipment in construction work.**
  - 1.1 State the necessity of different equipment in construction work.
  - 1.2 List the equipment required for different construction works.
  - 1.3 State the operation and maintenance of followings:
    - i) Concrete mixer machine
    - ii) Concrete hoisting and conveying instrument
    - iii) Excavator tractor
    - iv) Crawler
    - v) Crane (wheel mounted)
    - vi) Vibrator.
  - 1.4 Mention the specific use of the each equipment required for construction work.

**2 Understand the process of operation and maintenance of construction equipment.**

- 2.1 Mention the purpose of pumping and dewatering.
- 2.2 Describe the operation and maintenance of different pumps used in construction works.
- 2.3 Describe the operation and maintenance of earth excavation machine.
- 2.4 Describe the operation and maintenance of earth excavation machine.
- 2.5 Describe the operation and maintenance of roller machine.
- 2.6 Describe the operation and maintenance of brick cutter.
- 2.7 Describe the operation and maintenance of crushing (stone/Brick) machine.
- 2.8 Describe the operation and maintenance of concrete mixture machine.
- 2.9 Describe the operation and maintenance of concrete mix plant and carrier machine.
- 2.10 Describe the operation and maintenance of concrete pump and compaction machine.
- 2.11 Describe the operation and maintenance of concrete hoisting equipment.
- 2.12 Describe the operation and maintenance of different conveyor used in construction work.
- 2.13 Describe the operation and maintenance of different types of vibrate machine.
- 2.14 Describe the operation and maintenance roof top hoisting equipment.
- 2.15 Building dismantling (Debris Removal and transportation).

**3 Understand site development.**

- 3.1 State the meaning of site development.
- 3.2 Mention the purpose of site development.
- 3.3 Mention the site development by manual.
- 3.4 Mention the site development by mechanical equipment.
- 3.5 Describe the construction procedure in both of manual and mechanical system.
- 3.6 Mention the construction defects in site development.

**4 Understand the necessity and use of precast building components.**

- 4.1 State the terms pre-cast building components.
- 4.2 Mention the various types of pre-cast building components.
- 4.3 Mention the necessity of pre-cast building components.
- 4.4 Mention the advantage of pre-cast building components.
- 4.5 Describe the construction procedure of pre-cast building components.
- 4.6 Describe the following types of pre-cast building components.

- i) Pre-cast column
- ii) Pre-cast beam
- iii) Pre-cast slab
- iv) Pre-cast pipe and
- v) Pre-cast wall panel.

- 4.7 Describe the construction procedure of pre-cast building Components.
- 4.8 Mention the uses of precast building component.

**5 Understand the terms of waffle slabs or joist slabs.**

- 5.1 State the features of waffle slabs or joist slabs.
- 5.2 Describe the necessity of waffle slabs.
- 5.3 State the standard size of pans that are economically used to make waffle slabs.
- 5.4 Show the detailing of one way joist slabs.
- 5.5 Show the detailing of two way joist slabs (waffle slab).
- 5.6 Temperature reinforcement distribution of waffle slabs.
- 5.7 Mention the advantage and disadvantage of waffle slabs.
- 5.8 Differentiate between waffle slabs and flat slabs.
- 5.9 Differentiate between beam and joist.

**6 Understand the concept of Drainage system in building.**

- 6.1 State the meaning of drainage system.
- 6.2 Mention the various types of drainage system.
- 6.3 Describe the necessity of drainage system in buildings.
- 6.4 Briefly discuss about the following terms:
  - i) Open channel drainage system.
  - ii) Underground drainage system.
- 6.5 Describe the construction procedure of Underground drainage system.
- 6.6 Differentiate between Open channel drainage system and Underground drainage system.

**7 Understand the Ferro cement water tank and construction procedure.**

- 7.1 Define the Ferro Cement elements.
- 7.2 State the features of Ferro cement water tank.
- 7.3 Describe the construction procedure of Ferro cement plate.
- 7.4 State the assembling procedure of Ferro cement water tank.
- 7.5 Differentiate between Ferro cement water tank & RCC water tank.
- 7.6 Describe the advantages of Ferro cement water tank.

**8 Understand the Ferro cement sloping roof and construction procedure.**

- 8.1 Mention the features of Ferro cement sloping roof.
- 8.2 Describe the necessity of Ferro cement sloping roof.
- 8.3 Describe the advantages and disadvantages of Ferro cement sloping roof.
- 8.4 Mention different components of Ferro cement sloping roof.
- 8.5 Describe the construction procedure of Ferro cement sloping roof.
- 8.6 Describe the process of maintenance of Ferro cement sloping roof.

roof.

**9 Understand the Ferro cement roof channel.**

- 9.1 State the features Ferro cement roof channel.
- 9.2 Mention the necessity of Ferro cement roof channel.
- 9.3 Mention different structural drawing of Ferro cement roof channel.
- 9.4 Mention the structural stability of Ferro cement roof channel.
- 9.5 Describe the pre stressing procedure of Ferro cement roof channel.
- 9.6 Describe the construction procedure of Ferro cement roof channel.
- 9.7 Describe the procedure setting in position of Ferro cement channel.
- 9.8 Describe the stitching procedure with each other channel of Ferro cement roof channel.
- 9.9 Mention the flange casting system with Ferro cement roof channel.
- 9.10 Describe the factors to be considered during the inspection of Ferro cement roof channel costing and setting in position.
- 9.11 Describe the process of maintenance of Ferro cement roof channel roof structure.

**10 Understand the necessity and use of hollow block.**

- 10.1 Define the hollow block.
- 10.2 Mention the various types of hollow block.
- 10.3 Describe the necessity of hollow block.
- 10.4 Uses of hollow block.
- 10.5 Describe the construction procedure of hollow block.
- 10.6 Differentiate between hollow block and brick (simple block).



**11 Understand the feature of Arch system.**

- 11.1 State the arch system in structure.
- 11.2 Describe the various types of arch.
- 11.3 Describe the advantage of arch system in buildings.
- 11.4 Uses of arch in various structures.

**12 Understand the concept of low cost housing.**

- 12.1 State the necessity of low cost housing in Bangladesh.
- 12.2 Describe the construction procedure of low cost house.
- 12.3 Mention the advantages and disadvantages of low cost house.

**13 Understand landscaping.**

- 13.1 State the meaning of landscaping.
- 13.2 Mention the components of landscape.
- 13.3 Mention the factors to be considered to select the location for landscaping.
- 13.4 Mention the comparison of the landscaping with land development.
- 13.5 Explain the necessity of landscaping.
- 13.6 Describe the process of land development.
- 13.7 Define flower base and mention different types of flower base.

**14 Understand the fountains and ornamental stairs.**

- 14.1 Define fountains.
- 14.2 Mention the terms ornamentals stairs.
- 14.3 List the suitable materials used in ornamental stair..
- 14.4 Mention the components of fountains.
- 14.5 Describe different types of fountains.
- 14.6 Describe the mechanical components of fountains.
- 14.7 Describe the installation of water supply pipe line.
- 14.8 Describe the water re-cycling system for fountain.
- 14.9 Describe the procedure of connection of pump with water supply line.
- 14.10 Explain the fountain with sketch.
- 14.11 Describe the maintenance system of a fountain.

**Maintenance works**

**15 Understand the nature and importance of construction maintenance.**

- 15.1 Define maintenance.
- 15.2 Describe the types of maintenance.
- 15.3 Explain the significance of construction maintenance.
- 15.4 Explain the magnitude of construction maintenance in our country.
- 15.5 Describe the liability for defects in construction.
- 15.6 Describe the necessity of maintenance in construction work.
- 15.7 Mention the nature of maintenance.

**16 Understand the planning and maintenance works.**

- 16.1 State the need of planning maintenance work.
- 16.2 Mention the factors to be considered in formulating a maintenance policy.
- 16.3 List the procedural action to be followed to outline maintenance policy.
- 16.4 Explain the nature of planned maintenance.
- 16.5 Explain the necessity of computerized maintenance program.
- 16.6 State the need of maintenance manuals.
- 16.7 Describe the contents of manuals.

**17 Understand the procedure of execution of maintenance works.**

- 14.1 List the agents usually execute the maintenance work.
- 14.2 List the variety of ways of notification of defects.
- 14.3 Explain control card and request card used in execution of maintenance work.
- 14.4 Define maintenance feedback.
- 14.5 Explain maintenance feedback and feedback report.
- 14.6 Describe the components of maintenance procedure.
- 14.7 Describe the colored form (Red, White, Blue, Green) used in maintenance activity.
- 14.8 Describe the necessity of training for manager, supervisor and operatives for effective maintenance.
- 14.9 Explain the objective, scope and requirements of maintenance incentive scheme.

**18 Understand the supervision of maintenance works.**

- 18.1 State the main categories of supervisor of works.
- 18.2 Explain the duties of supervisor.
- 18.3 Define supervisor's diary with example.
- 18.4 Explain different types of reports.
- 18.5 Define monitoring and describe the necessity of monitoring in construction process.
- 18.6 Explain the features which should keep in mind during supervision of
  - i) Demolition works,
  - ii) Excavation works,
  - iii) Conceal works,
  - iv) Brick works,
  - v) Roofing,
  - vi) Plastering,
  - vii) Plumbing,
  - viii) Drainage works, and
  - ix) RCC casting.

**Practical:**

- 1 Identify different construction equipment used in particular purpose.
- 2 Prepare a routine maintenance schedule of different construction equipment.
- 3 Manufacture the following:
  - i) spun pre-cast RCC pipe
  - ii) fashion blocks
  - iii) pre-stressed concert pipes
  - iv) sanitary rings and slabs.
- 4 Identify and draw the sketcher of different low cost house available in Bangladesh.
- 5 Prepare models of different low cost house using traditional materials.
- 6 Manufacture the followings:
  - i) Ferro cement water tank
  - ii) Ferro cement sloping roof
  - iii) Ferro cement roof channel
- 7 Manufacture the following:
  - i) fountain
  - ii) flower base
  - iii) ornamental stairs
- 8 Prepare the models of
  - i) fountain
  - ii) flower base
  - iii) ornamental stairs

**REFERENCE BOOKS:**

- 1 Construction Technology (Vol-1 & Vol-2)  
- RE Calvert
- 2 The Site Agents Hand Book  
- RHB Ranns
- 3 Building Organization & Procedures (Second Edition)  
- G Froster
- 4 Building Construction  
- R S Khurmi

**8872 CONSTRUCTION ENGINEERING PROJECT**

<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>6</b>	<b>2</b>

**AIMS:**

- To be able to understand the Construction engineering project.
- To be able to develop skill for preparation of different features of Construction engineering project.
- To be able to gather experience of preparation of project report on building foundation and subsoil investigation.
- To be able to develop skill for interpretation of test result, truss, highway / railway, Flyover and environmental impact analysis.

**SHORT DESCRIPTION:**

Introduction to project work; Study and report on in respect of multi-storied building; Foundation design of a building; Truss (wooden and steel); Highway project; Railway project; Flyover project; Environmental impact analysis of a Construction project or any other similar project work as decided by the Head of the Department (HOD) and concern guide teachers.

**DETAIL DESCRIPTION:**

**1 Understand the general facts of project work.**

- 1.1 Define project.
- 1.2 Classify the project.
- 1.3 Define development project proposal (DPP).
- 1.4 State different items of DPP.
- 1.5 Explain the procedure of preparation of DPP.
- 1.6 List the items of expenditure of complete estimate.
- 1.7 Describe the procedural steps of a project report.
- 1.8 Define project proforma (PP).
- 1.9 State the different items of PP.
- 1.10 Explain the procedure of preparation of PP.
- 1.11 List the items of expenditure of complete estimate.
- 1.12 Give all the information of the report related to an estimate.
- 1.13 Describe the procedural steps of a project report.

**2 Prepare a project work on a multi-storied building.**

- 2.1 Select a line plan of a multi-storied (residential or commercial) building.
- 2.2 Draw the site plan and layout plan of the building.
- 2.3 Draw the plan, elevation and sections of the building.
- 2.4 Design different parts and members of the building.
- 2.5 Draw the detailed structural drawing of the building.

- 2.6 Estimate the quantities of different items of civil work of a building including water supply & sanitary works and internal electrification works.
- 2.7 Prepare a schedule of quantities with specifications and the estimate of building.
- 2.8 Prepare an abstract of cost from the estimate.
- 2.9 Prepare a technical report for the building project.
- 2.10 Prepare a Multimedia presentation of the Project.

### **3 Prepare the design of foundation of a building.**

- 3.1 Select a 6-storied residential building the foundation of which is to be designed.
- 3.2 Perform a reconnaissance survey at the proposed building site.
- 3.3 Collect soil samples from the building site.
- 3.4 Perform different tests for the soil samples.
- 3.5 Summarize the test results.
- 3.6 Interpret the test results.
- 3.7 Select two alternatives of foundation for the building.
- 3.8 Design the alternative foundations for the building.
- 3.9 Estimate the foundation cost for two alternatives.
- 3.10 Compare and decide which foundation is better for the building.
- 3.11 Prepare a final report for the project.
- 3.12 Prepare a Multimedia presentation of the Project.

### **4 Prepare a project work on truss (wooden and steel).**

- 4.1 Select and draw a workshop/warehouse showing the position of trusses.
- 4.2 List and sketch different types of truss suitable for the said workshop/warehouse.
- 4.3 Select two different alternatives from the list.
- 4.4 Calculate the load to be carried by the trusses.
- 4.5 Determine the stress of different members of the trusses.
- 4.6 Design different members of the trusses.
- 4.7 Design gusset plates and rivet of the trusses.
- 4.8 Estimate the quantity of materials required for the trusses and 2 coats of painting over a coat of priming.
- 4.9 Prepare a schedule of quantities with specifications of the items of works for the alternatives.
- 4.10 Prepare an abstract of cost from the estimate of the trusses.
- 4.11 Compare the alternatives and decide which one is acceptable.
- 4.12 Prepare a technical report for the project.
- 4.13 Prepare a Multimedia presentation of the Project.

## **5 Prepare a project work on Construction of Highway/ Railway.**

- 5.1 Select the type and location of the project.
- 5.2 Visit the project site.
- 5.3 Make reconnaissance survey, preliminary survey and location survey of the project.
- 5.4 Plot the area of the project.
- 5.5 Draw the detailed drawing of the project.
- 5.6 Estimate the different items of works.
- 5.7 Prepare a schedule of quantity with specification of the items of work of the project.
- 5.8 Prepare a technical report for the project.
- 5.9 Prepare a Multimedia presentation of the Project.

## **6 Prepare a project work on Construction of Bridge.**

- 6.1 Select the type and location of the project.
- 6.2 Visit the project site.
- 6.3 Make reconnaissance survey, preliminary survey and location survey of the project.
- 6.4 Plot the area of the project.
- 6.5 Draw the detailed drawing of the project.
- 6.6 Estimate the different items of works.
- 6.7 Prepare a schedule of quantity with specification of the items of work of the project.
- 6.8 Prepare a technical report for the project.
- 6.9 Prepare a Multimedia presentation of the Project.

## **7 Prepare a project work on Construction of Fly over.**

- 7.1 Select the type and location of the project.
- 7.2 Visit the project site.
- 7.3 Make reconnaissance survey, preliminary survey and location survey of the project.
- 7.4 Plot the area of the project.
- 7.5 Draw the detailed drawing of the project.
- 7.6 Estimate the different items of works.
- 7.7 Prepare a schedule of quantity with specification of the items of work of the project.
- 7.8 Prepare a technical report for the project.
- 7.9 Prepare a Multimedia presentation of the Project.

## **8 Prepare an environmental impact analysis (EIA) of a particular Construction project.**

- 8.1 Select the type and location of a particular project.
- 8.2 Visit the project site.
- 8.3 Prepare a checklist with significant environment parameters.
- 8.4 Develop questionnaires to collect field data.
- 8.5 Complete initial environment examination (IEE) through checklist.
- 8.6 Perform follow-up activities and identify mitigating measures needed.
- 8.7 Prepare IEE report.
- 8.8 Prepare an environmental impact analysis (EIA) report according to the IEE report.
- 8.9 Prepare a Multimedia presentation of the Project.

**Note:** Report on any one of the project is to be submitted by a group of students consisting of more than 4 and less than 8. The Head of the Department or the concerned guide teacher(s) may decide for similar project other than those as stated above.

**8873 CONSTRUCTION MANAGEMENT AND DOCUMENTAION**

T P C  
3 3 4

*AIMS*

- To be able to understand the modern techniques of construction management.
- To be able to understand the organization of contract department.
- 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 prequalification documents.
- To be able to evaluate prequalification documents.
- To be able to prepare technical specifications.
- 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 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 Materials; 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 consultant services.
- 2.11 State the conditions for enlistment of consultant 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 preparation of a construction schedule.
- 3.4 Explain the method of calculating project length.
- 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 4-storied building 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
  - material handling, storage and disposal,
  - handling of machinery and mechanical equipment and operating motor vehicles.
- 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 and cost control process in construction management.**

- 6.1 Define quality 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
  - the consultant.
- 6.4 Draw a flow diagram of a quality plan.
- 6.5 Describe the responsibilities to control the quality of construction of
  - the client,
  - the designer,
  - the manufacturer,
  - the contractor and
  - 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
- Daywork
- 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 Interpret 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 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
- 9 Project Management, A System Approach to Planning,  
Scheduling and Controlling (Second Edition)  
- Harold Kerzner

**6474 DESIGN OF STRUCTURE – II**

**T P C  
3 3 4**

**AIMS**

- To be able to select the suitable reinforcement and section required for reinforced cement concrete solid floor / roof slab and column.
- To be able to select the suitable reinforcement and section required for reinforced cement concrete stair slab.
- To be able to select the suitable reinforcement and section required for reinforced cement concrete footing for brick wall and concrete wall.
- To be able to select the suitable reinforcement and section required for reinforced cement concrete column footing.
- To be able to select the 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 solid slab, stair slab, column, wall footing, column footing and cantilever retaining wall; Prestressed concrete and Miscellaneous RCC structures.

**DETAIL DESCRIPTION**

**Theory:**

**1 Understand the concept of floor slab.**

- 1.1 Describe different types of reinforced cement concrete floor slab.
- 1.2 State the loads to be considered in designing reinforced cement concrete floor slabs.
- 1.3 Compare between reinforced cement concrete one-way and two-way solid 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 solid slab.
- 2.2 Explain the necessity of shrinkage and temperature reinforcement in one-way solid slab.
- 2.3 Mention the steps to be followed in designing reinforced cement concrete one-way solid slab.
- 2.4 Design reinforced cement concrete one-way solid slab with supplied data in both WSD and USD methods.
- 2.5 Design a reinforced cement concrete cantilever solid slab in WSD method.
- 2.6 Design a reinforced cement concrete balcony slab in WSD method.
- 2.7 Design a one-way reinforced brick(RB) slab in WSD method.

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

- 3.1 State the minimum thickness of reinforced cement concrete two-way solid slab.
- 3.2 Explain the use of bending moment coefficient in designing reinforced cement concrete two-way solid slab.
- 3.3 State the meaning of column strip and middle strip in two-way solid slab.
- 3.4 Design reinforced cement concrete two-way solid slab with supplied data in WSD method.
- 3.5 Explain the necessity of corner reinforcement in two-way solid slab.

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

- 4.1 List various kinds of stair.
- 4.2 Mention the relation in between tread and rise according to American standard and Indian standard.
- 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 column.**

- 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 reinforced cement concrete tied column.
- 5.8 Design reinforced cement concrete spiral column.

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

- 6.1 Explain safe bearing capacity of soil.
- 6.2 Determine the width of foundation bed of spread footing and RCC wall footing.
- 6.3 Describe the critical section for moment, shear and bond of brick wall footing and concrete wall footing.
- 6.4 Design reinforced cement concrete footing for brick wall and concrete wall.
- 6.5 Describe the critical section for moment, shear and bond of concrete column footing.
- 6.6 Design the independent reinforced cement concrete column(blocked) footing.
- 6.7 Design the independent reinforced cement concrete column (sloped) footing.

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

- 7.1 Name the different types of retaining wall with typical sketches.
- 7.2 Calculate the earth pressure related to cantilever non-surcharged retaining wall and 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 and 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 reinforced cement concrete cantilever non-surcharged retaining wall and surcharged retaining wall.
- 7.7 Check the stability of cantilever non-surcharged retaining wall and surcharged retaining wall.

## **8 Understand the concept of prestressed concrete.**

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

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

Explain the reinforcement placement of the following structures:

- a. Raft or Mat foundation
- b. Combined footing and cantilever footing
- c. Basement floor
- d. Column and Beam Connection
- e. Two-span box culvert
- f. Bridge deck slab of T-beam
- g. Sluice gate
- h. Counter fort retaining wall
- i. Flat slab & Flat plate slab
- j. Ramp
- k. Helical stair slab
- l. spiral stair slab
- m. Overhead water tank of rectangular and dome shaped.
- n. Under ground water reservoir of rectangular .

### **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: Drawing should include:**

- \* 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.

**Note-2: Class teacher may arrange a field/industry visit to see the practical reinforcement fabrication works of any RCC structure or any construction project.**

#### **REFERENCE BOOKS**

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

6473

TRANSPORTATION ENGINEERING – II

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; Curvature of track; Super elevation; Station and yard; Points and crossings; Signaling; Railway bridges and culverts; Maintenance of railway; Tunneling; Harbor and Port.

### DETAIL DESCRIPTION

#### Theory:

#### 1 Understand the history of railway.

- 1.1 Describe a brief history of railways.
- 1.2 Mention the characteristics of railways.
- 1.3 Describe the advantages of railways.
- 1.4 Comparison between highway and railways.
- 1.5 Describe the future of railways in Bangladesh.

#### 2 Understand the railway surveys.

- 2.1 Mention the objectives of railway surveys.
- 2.2 Explain the reasons for laying a new railway line.
- 2.3 Describe the importance of reconnaissance survey for railways.
- 2.4 Describe the process of preliminary survey for railways.
- 2.5 Describe in details the location survey for railways.

#### 3 Understand the permanent way.

- 3.1 Define permanent way .
- 3.2 State the requirements of permanent way.
- 3.3 Define rail and rail gauge.
- 3.4 Mention the functions and requirements of an ideal rail.
- 3.5 Mention different types of rail.
- 3.6 Mention the advantages of flat footed rail.
- 3.7 Illustrate weight and section of rail.
- 3.8 Explain the effect of corrosion of rails.

- 3.9 Mention the points that govern the length of rail.
- 3.10 State the meaning and causes of wear of rail.
- 3.11 Describe the methods adopted to reduce wear of rail.
- 3.12 Mention the causes of failure of rails.
- 3.13 Illustrate the term coning of wheel, its disadvantages of coning of wheel and its remedy.
- 3.14 State the meaning of hogged rails.
- 3.15 Describe the methods of rectifying damaged rail.
- 3.16 Illustrate buckling of rail and the precautions to be taken to prevent buckling of rail.

#### **4 Understand the concept of rail fastening.**

- 4.1 State the meaning of fastening.
- 4.2 Mention the requirements of an ideal rail fastening.
- 4.3 Mention different types of rail joint.
- 4.4 Mention the characteristics of an ideal rail joint.
- 4.5 State the meaning of bearing plate, fish plate, spikes, hook bolt, fang bolt, Chair and keys.
- 4.6 Describe welding rail
- 4.7 Mention the advantages and disadvantages of welding rail.

#### **5 Understand the concept of using sleeper in permanent way.**

- 5.1 State the meaning of sleeper.
- 5.2 Mention the functions of sleeper.
- 5.3 Mention the requirements of an ideal sleeper.
- 5.4 Mention the classification of sleeper.
- 5.5 List the materials used for sleeper.
- 5.6 Mention the advantages & disadvantages and limitations of timber sleeper.
- 5.7 Mention the advantages & disadvantages and limitations of steel sleeper.
- 5.8 Mention the advantages & disadvantages and limitations of cast iron sleeper.
- 5.9 Mention the advantages & disadvantages and limitations of concrete sleeper.
- 5.10 Explain the density of sleepers.

#### **6 Understand the concept of using ballast in permanent way.**

- 6.1 State the meaning of ballast.
- 6.2 Mention the functions of ballast.
- 6.3 Mention the characteristics of good ballast.
- 6.4 Mention the requirements of an ideal material for ballast.
- 6.5 Describe the materials used as ballast with their advantages and disadvantages.
- 6.6 Specify the size of good quality ballast.
- 6.7 State the meaning of depth of ballast.
- 6.8 State the meaning of screening of ballast.
- 6.9 Describe the process of screening of ballast.
- 6.10 Describe the quantity of ballast needed for construction of permanent way.

#### **7 Understand the concept of creep in permanent way.**

- 7.1 State the meaning of creep.
- 7.2 Mention the causes of creep in permanent way.
- 7.3 Explain the factors to determine the magnitude of creep.
- 7.4 Explain the effect of creep in permanent way.
- 7.5 Describe the procedure of measuring the amount of creep.
- 7.6 Describe the methods of correcting the creep.

## **8 Understand the curvature in railway track.**

- 8.1 Mention the disadvantages of curvature in a railway track.
- 8.2 Mention different types of curve used in railway track.
- 8.3 State the meaning of degree of curve or limiting radius of a curve.
- 8.4 Define transition curve.
- 8.5 Mention the necessity of transition curve in a railway track.
- 8.6 Calculate the length of transition curve in a railway track.
- 8.7 State the meaning of shift.
- 8.8 Calculate the amount of shift in a railway.

## **9 Understand the super elevation on curves.**

- 9.1 State the meaning of super elevation or cant.
- 9.2 Mention the purposes of super elevation on a curve.
- 9.3 Describe the factors which affect the super elevation.
- 9.4 Calculate the quantity of super elevation in a railway track.
- 9.5 Define cant deficiency, equilibrium cant, negative cant and cant gradient.
- 9.6 Explain the speed of train on curve.
- 9.7 List the procedure for finding respective speeds on main line and branch line.

## **10 Understand the concept of station and yard.**

- 10.1 Define railway station.
- 10.2 Mention the purposes of a railway station.
- 10.3 Mention different types of railway station.
- 10.4 Describe the features of a railway station.
- 10.5 Describe the points to be considered for selecting the site of a railway station.
- 10.6 State the meaning of wayside station.
- 10.7 Define railway yard.
- 10.8 Describe different types of yard in railway.
- 10.9 Describe different types of platform used in railway.
- 10.10 Differentiate between junction and terminal.

## **11 Understand the concept of points and crossings.**

- 11.1 Define points and crossings.
- 11.2 Mention the purposes of points and crossings.
- 11.3 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.
- 11.4 Describe the method of laying sleepers for points and crossings.
- 11.5 Describe the steel used for points and crossings.

- 11.6 Describe the shape of switches.
- 11.7 State the meaning of clearance and switch angle.
- 11.8 State the meaning of crossing.
- 11.9 Describe different types of crossing.
- 11.10 Describe the theoretical nose of crossing and actual nose of crossing.
- 11.11 Define the terms: crossing clearance, crossing number and crossing angle.
- 11.12 Mention the advantages and disadvantages of level crossing.
- 11.13 Describe the points to be considered in maintaining points and crossing.

## **12 Understand the aspects of signaling in railways.**

- 12.1 Explain the importance of signaling in railways.
- 12.2 Describe different types of signal.
- 12.3 Describe a typical layout of signal.
- 12.4 Discuss the control of movement of trains.
- 12.5 Describe the following trains system.
- 12.6 Describe the absolute block system.
- 12.7 Describe pilot guard system.
- 12.8 Describe centralize traffic control system.
- 12.9 Describe automatic signaling.
- 12.10 State the meaning of interlocking.
- 12.11 Mention the essential principles of interlocking.
- 12.12 Describe the methods of interlocking.

## **13 Understand the features of Railway Bridge and culvert.**

- 13.1 Describe the major components of a railway bridge/culvert.
- 13.2 Define the terms: span, flood discharge, waterway, and scour depth, depth of foundation, afflux clearance and free board.
- 13.3 Mention different types of railway bridge/culvert.
- 13.4 Mention the points to be considered in locating the site for a railway bridge/culvert.
- 13.5 Explain the type of loading on a railway bridge/culvert.

## **14 Understand the concept of maintenance work in railway.**

- 14.1 Explain the necessity for maintenance work in railway.
- 14.2 Mention the advantages of good track maintenance.
- 14.3 Describe the maintenance work of a track.
- 14.4 Describe the duties of gang mate, key man and permanent way inspector (PWI) in the maintenance work.
- 14.5 Describe the maintenance work of railway bridge/culvert.
- 14.6 Describe the process of maintenance work of rolling stock.
- 14.7 Mention the causes of accident in a railway track.
- 14.8 Describe the process of signaling during maintenance work.
- 14.9 Describe the necessity of speed restriction during maintenance work.
- 14.10 List the name of tools required for maintenance work.
- 14.11 Describe the process of packing of ballast in a railway track.
- 14.12 Explain the importance of inspection of rails.

- 14.13 Mention the process of inspection of track.
- 14.14 Describe the maintenance and boxing of ballast.

### **15 Understand the tunneling in railways.**

- 15.1 Define tunnel.
- 15.2 Mention the purpose of tunnels.
- 15.3 Describe a brief history of development of tunnels.
- 15.4 Describe the development of railway tunnels.
- 15.3 Describe the advantages and disadvantages of tunnels.
- 15.4 Mention the economics of tunneling.
- 15.5 Mention the favorable condition for the tunnel construction.
- 15.6 Mention the classification of tunnels.
- 15.7 Describe the size and shape of tunnels with neat sketches.
- 15.8 Mention the advantages of underground railways.
- 15.9 Mention the points to be considered in connection with the maintenance of railway tunnels.

### **16 Understand the basic concept of harbor.**

- 16.1 State the meaning of harbor.
- 16.2 Mention the purposes and utility of harbor.
- 16.3 Mention different types of harbor.
- 16.4 Mention the suitable location for harbor.
- 16.5 Describe the following terms: natural harbor, semi-natural harbor, artificial harbor, military harbor and commercial harbor.

### **17 Understand the basic concept of port.**

- 17.1 State the meaning of port.
- 17.2 Mention the purposes and utility of port.
- 17.3 Classify different types of port.
- 17.4 Mention the suitable location for port.
- 17.5 Mention the points to be considered in selecting the site for a port.
- 17.6 Write briefly on port of entry, ocean port, inland waterway port, free port, and anchorage area, marine terminal, turning basin, gross tonnage, cargo or freight tonnage and balance.

### **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 mixed 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 different ballast section.
7. Draw the sketches of wayside station, junction and terminals showing platform and other components.
8. Draw the sketches of main track and side track of a double line railway station.
9. Draw the sketches of different types of yards in railway.
10. Draw the sketches of a level crossing showing all components.
11. Draw the sketches of points and crossing showing all components.
12. Draw the sketches of triangle, scotch block, buffer stop and derailing switch.
13. Draw the sketches of acute crossing, double crossing, square crossing and diamond crossing.
14. Prepare a model of a typical points and crossing using aluminum channel, wooden sleepers and other available materials.
15. Visit to a nearby station to see the different components of a railway station and submit a report.
16. Visit to an important harbor and port.

### **REFERENCE BOOKS**

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

6472	ENVIRONMENTAL ENGINEERING –II	T	P	C
		2	3	3

### **AIMS**

- To be able to compare various methods and techniques used to treat and dispose of sewage and control of water pollution and select appropriate methods for given situations.
- To be able to identify various sewer pipes, fittings, procedures of construction, repair, replacement and maintenance of sewage disposal system.
- To be able to determine the size of circular sewer pipes, septic tanks and soak pit of sewage disposal system.
- To be able to compare various types of pit latrine and biogas generating plants.
- To be able to understand the basic concept of solid waste and management.

### **SHORT DESCRIPTION**

Sewage general consideration; Sewer pipe; Sewer appurtenance; Flow in sewer; Construction of sewer; Maintenance of sewer; Characteristics of sewage; Sewage disposal; Preliminary Sewage treatment system; Secondary treatment system; Sludge treatment and disposal; Water pollution and its effects on the environment; Rural sanitation; Health and hygiene; Generation of biogas; Sources and classification of solid waste; Municipal and industrial solid waste; different steps of solid management.

### **DETAIL DESCRIPTION**

#### **Theory:**

- 1 Understand the general consideration of sewerage system.
  - 1.1 Define sewage
  - 1.2 Explain conservancy system and water carriage system of sewage.
  - 1.3 Compare various types of sewerage system.
  - 1.4 Outline the advantages and limitations of sewerage system and septic tank.
- 2 **Understand the sewer pipes and techniques of their joint.**
  - 2.1 Identify various types of sewers of a complete sewerage system.
  - 2.2 Compare the advantages and limitations of uses of different kinds of sewer pipes according to materials of construction.
  - 2.3 Identify the pipes of different materials for different uses.



- 2.4 Draw the cross-section of different types of sewers, with different types of bedding and for different individual uses and ground conditions.
- 2.5 Describe various kinds of joint in connecting the pipes with the help of sketches.
- 2.6 List the requirements of a good sewer joint.
- 2.7 Describe the process of jointing two pipes of different materials.
- 2.8 Identify methods of limiting the corrosion of sewer pipes.

### **3. *Understand appurtenances and their purposes.***

- 3.1 Identify various sewer appurtenances.
- 3.2 Describe various sewer appurtenances with the help of sketches and state their functions.
- 3.3 Discuss the factors to be considered for locating the sewer appurtenances so that their function can be achieved.
- 3.4 Explain the junction chamber and regulator with sketches.
- 3.5 Draw a neat sketch of siphon & inverted siphon and describe their functions.
- 3.6 Describe the necessity of pumping sewage.
- 3.7 Discuss the requirements of sewage pumps.
- 3.8 List various types of sewage pumps.
- 3.9 List the points that should be considered in locating the site of pumping station and state the capacity of pump and pumping stations.

### **4. *Understand the process of designing sewers.***

- 4.1 State different conditions of flow through a sewer.
- 4.2 Identify self cleansing velocity and grades of sewer.
- 4.3 Describe the formulas with notations for various kinds of flow of sewage.
- 4.4 Explain dry weather flow and storm weather flow.
- 4.5 Calculate the quantity of storm rain by the following methods:
  - a) Rational method
  - b) Empirical method
- 4.6 Explain the factors influencing of sewage pipe design.
- 4.7 Identify different hydraulic elements that govern the flow or discharge of sewage through a sewer.
- 4.8 Identify the common symbols used in hydraulic formula.
- 4.9 Solve problems of discharge rates for circular sewers using cheese's of section.

**5. *Understand the principle of construction of sewers.***

- 5.1 Explain general aspects for preparation of sewerage scheme.
- 5.2 Describe procedures followed in the construction of sewers.
- 5.3 Explain the procedure of laying a sewer in a trench.
- 5.4 Explain under what circumstances the sheeting (timbering), bracing and dewatering of trenches are required.
- 5.5 Specify with sketch, the setting- out of the fall of sewer for the continuous gravitational flow of sewage.
- 5.6 Describe the construction of brick sewer and concrete sewer.
- 5.7 Describe the remove of sheeting (timbering) of trenches.
- 5.8 Describe the techniques of testing sewer lines and the precautions should be taken during back filling of trenches.
- 5.9 State different ways of protection for sewer.
- 5.10 Explain the reasons why sewers must be properly ventilated.
- 5.11 Describe the methods adopted for ventilating sewers.

**6. *Understand the process of maintenance of sewer.***

- 6.1 Identify the need for maintenance of sewer.
- 6.2 List various types of sewer.
- 6.3 Identify the precautions to be taken before entering in sewers.
- 6.4 Identify the factors to be considered for frequent inspection and supervision of sewer so that proper flow is maintained.
- 6.5 List the main problems which are faced in maintenance of sewer.
- 6.6 Describe the procedures used to clean and unlock sewer.

**7. *Understand the characteristics of sewage.***

- 7.1 Describe the constituents of sewage.
- 7.2 Outline the necessity of examination of sewage.
- 7.3 Describe physical characteristics of sewage and their tests.
- 7.4 Explain the importance of determination of solids in sewage.
- 7.5 Describe various chemical tests of sewage.
- 7.6 Describe the importance of common laboratory in the treatment of sewage.
- 7.7 Describe the role of aerobic and other micro-organism in the decomposition of sewage.
- 7.8 Explain the following terms:
  - a) Anaerobic active in sewage

- b) Biochemical oxygen demand(BOD)
- c) Chemical oxygen demand(COD)
- d) Population equivalent
- e) Nitrogen and carbon cycles
- f) pH value and strength of sewage

**8. *Understand the methods used for sewage disposal.***

- 8.1 List various methods of sewage disposal.
- 8.2 State the characteristics of soil which influence waste water disposal.
- 8.3 Explain the term dilution and its suitability.
- 8.4 Describe septic tank.
- 8.5 Draw a neat sketch of septic tank and soak well.
- 8.6 Design septic tank.
- 8.7 Compare the design of septic tanks with a soak pit for 20, 50 and 100 users respectively.
- 8.8 Explain with sketches the construction and operation of a septic tank.

**9. Understand the method of sewage treatment.**

- 9.1 Identify the various condition which directly affect the self purification of sewage in streams.
- 9.2 Identify the conditions for favoring the sewage self-purification in lakes.
- 9.3 Outline the stages of sewage treatment.

- 9.4 Explain the purpose of preliminary sewage treatment.**
  - 9.5 Explain partial flume.**
  - 9.6 Explain the following with the help of sketches:**
    - a) Detritus tanks (grit chambers)**
    - b) Skimming tanks.**
  - 9.7 Describe the function of communicators.**
  - 9.8 Name different kinds of treatment process for removing impurities of each stage of the treatment process.**
  - 9.9 Describe the schematic layout of a typical sewage treatment plant.**
  - 9.10 Describe the vacuum flotation method for removing greases and oils.**
  - 9.11 Describe with the help of neat sketch of a sedimentation tank giving the factors, which reduce the efficiency of sedimentation tanks.
- 10. Understand the principles of sewage treatment.**
- 10.1 Distinguish between primary treatment and secondary treatment and list the various secondary treatment processes.
  - 10.2 Explain the principle of biological treatment process of sewage.
  - 10.3 Describe with the help of sketches the construction and working principles of the following filters:
    - a) Intermittent sand filters
    - b) Trickling filters
    - c) Contract beds
  - 10.4 Describe the re-circulation of sewage and state its advantages.
  - 10.5 Identify the factors which influence the working of a tricking filter.
  - 10.6 List the advantages and disadvantages of activated sludge process.
  - 10.7 Explain the purification of sewage by activated sludge process.
  - 10.8 Explain the term aeration in relation to sewage treatment.
  - 10.9 Identify the function of oxidation ponds.
- 11. Understand the process of sludge treatment and the method of disposal.**
- 11.1 List the various sources of sludge.
  - 11.2 Describe the properties of sewage sludge produced in various treatment processes.

- 11.3 Mention the amount of sewage sludge produced in various treatment processes.
- 11.4 Explain different purposes served by the sludge digestion.
- 11.5 Distinguish between anaerobic digestion and aerobic digestion.
- 11.6 Describe the working principles of a vacuum filters and drying beds.
- 11.7 Identify the methods of ultimate disposal of sludge.
- 11.8 Explain advantages and environmental disadvantages of incinerating sludge.

## **12 Understand the water pollution and its effects on the environment.**

- 12.1 Identify the undesirable changes and its effects of pollution on-
  - a) Human life
  - b) Animal life
  - c) Aquatic life
- 12.2 Describe various sources of water pollution.
- 12.3 Classify different types of pollution and explain clearly each type of pollution.
- 12.4 Describe the precautions that should be taken to prevent pollution of water sources from domestic and industrial effluent disposal systems.

Understand the rural sanitation practices in Bangladesh.

Pit latrine technology:

- a) Describe the ventilated improved pit (VIP) latrine and simple pit latrine.
- b) Draw a neat sketch of VIP latrine and describe the special features of VIP latrine.
- c) Mention the advantages & disadvantages of VIP and simple pit latrine.

Pour flush technology:

- a) Describe the single/twin pit pour flush latrine.
- b) Types of single/twin pit pour flush latrine.
- c) Mention the advantages & disadvantages of single/twin pit pour flush latrine.
- d) Compare the advantages and disadvantages of using twin pit latrine over septic tank.

Construction and maintenance of sanitation facilities:

- a) Describe the construction procedures of VIP, simple pit, single and twin pit pour flush latrine.
- b) Describe the construction procedure of small bore sewer system.

Understand health and hygiene.

- 14.1 Describe the common diseases.

Explain the causes of transmission of these diseases.

Describe how to control these diseases.

Explain the importance of hygiene education.

Describe the scope and methodology for hygiene education.

Explain the advantages of social mobilization for hygiene practice.

Explain integrated approach for water, sanitation and health education.

Understand the concept of biogas.

Explain the process of generating fuel gas with cow dung /human waste / other organic wastes.

Explain the term biogas.

Explain the working principle of a biogas plant with the help of neat sketch.

Describe the construction procedure of a biogas plant.

Specify the energy output and compare with energy input of small scale biogas plant and find the efficiency.

Compare the advantages and disadvantages of using small scale biogas plant in Bangladesh.

**16 Understand the source and classification of solid waste.**

- 16.1 Define solid waste.  
refuse, rubbish, hazardous waste, recycling, material conversion and energy recovery.
- 16.2 List the sources of solid waste.
- 16.3 Mention the classification of solid waste.
- 16.4 Describe garbage and rubbish with example.
- 16.5 Describe pathological wastes.
- 16.6 Describe industrial waste.
- 16.7 Describe agricultural waste.
- 16.8 Describe the solid waste generated in the chemical process industries.
- 16.9 Describe hazardous waste with example.

**17 Understand the municipal and industrial solid waste.**

- 17.1 Describe the classification of municipal solid waste materials.
- 17.2 Describe the general sources of municipal solid waste.
- 17.3 Describe the garbage, rubbish and trash.
- 17.4 Mention the classification of different types of industrial solid waste.
- 17.5 Describe the hazardous industrial solid waste.

**18. Understand steps of solid waste management.**

- 18.1 List different steps for collecting solid waste.
- 18.2 Mention different steps for disposal solid waste.
- 18.3 Show with neat sketches the flow diagram of different steps of solid waste management from generation to disposal.

**Practical:**

**1 Sketch different types of plumbing fixtures.**

Draw sketches of water closet suite which includes a commode, flushing cistern and connecting pipe etc. showing necessary dimensions.

Draw the sketches of bath tub, shower bath, urinals, lavatory or wash basin, sink, laundry tray, drinking fountain etc. showing dimensions including their levels.

Draw the sectional view of an automatic flushing tank with a flush valve and indicate individual name of each part.

**Sketch manhole, septic tank and soak pit.**

Draw the plan views and detail sectional views of manhole, septic tank and soak pit indicate the individual parts.

Show the dimensions of manhole, septic tank and soak pit.

*Make connection of different sanitary fixtures.*

3.1 Select tools and equipment and necessary materials required to connect sanitary fixtures.

3.2 Arrange support for fixtures, make proper level and install the fixtures giving required connections for use.

**Replace unserviceable sanitary fixtures.**

Apply correct methods for repairing and replacing unserviceable sanitary fixtures.

Select proper tools and equipment and materials needed for repairing unserviceable fixtures.

Detect the defect of fixtures and get the work done.

Prepare a model of manhole, septic tank and soak pit.

Sketch Pit latrine, Twin pit latrine, VIP latrine and sketching, layout plan of pipe line.

6.1 Draw plan, section and sectional elevation of pit latrine, twin pit latrine, VIP latrine.

6.2 Draw neat sketch of layout plan of pipe line.

**7 Prepare a model of slab with water seal pan with ring.**

- 8. Perform a case study in solid waste management (generation to disposal) of your campus.**



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ENTREPRENEURSHIP

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**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 case study

**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.

Insurance ; case study.

**DETAIL DESCRIPTION**

Theory :

**1 Understand the basic concept of entrepreneurship & entrepreneur.**

- 1.1 Define entrepreneurship & entrepreneur.
- 1.2 Discuss the characteristics and qualities of entrepreneur.
- 1.3 Mention the classification of entrepreneur.
- 1.4 Discuss the case entrepreneurship and mass entrepreneurship.
- 1.5 Discuss the necessity of entrepreneurship as a career.
- 1.6 Discuss the function of entrepreneur in developing countries.
- 1.7 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 that the economic development is a process.
- 2.3 Describe the entrepreneurship as a factor of economic development.
- 2.4 Discuss the capital accumulation or rate of savings.
- 2.5 Discuss the role of entrepreneur in the technological development and their introduction into production Process.
- 2.6 Discuss the entrepreneur in the discovery of new sources of resources.
- 2.7 Discuss the entrepreneur in the discovery of new product.
- 2.8 Discuss the discovery of new markets.

**3 Understand the concept of entrepreneurship in the theories of economic growth.**

- 3.1 Define entrepreneurship in the theories of economic growth.
- 3.2 Discuss the theory of need for achievement of Devid MacClelland.
- 3.3 Discuss the Malthusian theory of population and economic growth.
- 3.4 Discuss the labour theory of production and limit to growth.
- 3.5 Discuss the Keynesian theory of employment and output.
- 3.6 Discuss the stage theory of growth.
- 3.7 Discuss the Schumpeterian theory of economic development.
- 3.8 Discuss the entrepreneurship motive in economic development.

**4 Understand the sources of vantage ideas in Bangladesh.**

- 4.1 Define sources of venture ideas in Bangladesh.
- 4.2 Discuss different types of sources of venture ideas in Bangladesh.
- 4.3 Discuss informal sources of venture ideas in Bangladesh.

**5 Understand the evaluation of venture ideas.**

- 5.1 Define evaluation of venture ideas.
- 5.2 Discuss the factors that influence the selection of venture ideas.
- 5.3 Discuss the evaluating financial aspects of business.
- 5.4 Discuss the determinants of the firm size.

**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.
- 7.5 Discuss the self assessment of entrepreneurial qualities.

**8 Understand the concept of entrepreneurial motivation.**

- 8.1 Define entrepreneurial motivation.
- 8.2 Discuss the achievement motivation theory.
- 8.3 Describe the means of improving achievement motivation.
- 8.4 Discuss the background of high need achievement.
- 8.5 Describe the problems associated with high need achievement.

**9 Understand the business plan and the concept of the environment for entrepreneurship.**

- 9.1 Define business plan.
- 9.2 Describe the importance of business plan.
- 9.3 Discuss the contents of business plan.
- 9.4 Describe the business plan proforma.
- 9.5 Define environment of business.
- 9.6 Describe the factors which effect environment on entrepreneurship
- 9.7 Discuss the aspects of business environment

**10 Understand the concept of sources of assistance & industrial sanctioning procedure.**

- 10.1 Define sources of assistance.
- 10.2 Describe different types of sources of assistance.
- 10.3 Describe entrepreneurship development cycle.
- 10.4 Discuss the aid of sources.
- 10.5 Discuss the industrial policy.
- 10.6 Describe the technique of industrial policy.
- 10.7 Define foreign aid.

**11 Understand the insurance and premium.**

- 11.1 Define insurance and premium
- 11.2 Describe the essential conditions of insurance contract.
- 11.3 Discuss various types of insurance.
- 11.4 Distinguish between life insurance and general insurance.

**12 Understand the concept of case studies.**

12.1 Define case study.

12.2 Discuss the objectives of case study.

12.3 Describe the method of case analysis.

12.4 Discuss the importance of case study.

12.5 Mention the advantages and disadvantages of case study