



BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207.

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

CIVIL TECHNOLOGY
TECHNOLOGY CODE: **664**

2nd SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

CIVIL TECHNOLOGY (664)

2nd SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total	
						Theory		Practical			
						Cont. assess	Final exam	Cont. assess	Final exam		
1	66421	Civil Engineering Materials	2	3	3	40	60	25	25	150	
2	65722	Communicative English	1	3	2	20	30	50	0	100	
3	65921	Mathematics-2	3	3	4	60	90	50	0	200	
4	65922	Physics-2	3	3	4	60	90	25	25	200	
5	66611	Computer Application	0	6	2	0	0	50	50	100	
6	66822	Electronic Engineering Fundamentals	2	3	3	40	60	25	25	150	
7	65812	Physical Education and life Skill Development	0	3	1	0	0	25	25	50	
Total			11	24	19	220	330	250	150	950	

66421

CIVIL ENGINEERING MATERIALS

T P C
2 3 3

AIMS

- To be able to identify and classify the materials used for construction in civil engineering field.
- To be able to recognize the sources of various civil engineering materials.
- To be able to understand the characteristics of various civil engineering materials.
- To be able to understand the uses of different civil engineering materials.

SHORT DESCRIPTION

Aspects of engineering materials; Engineering uses of Stone; Bricks; Sand; Cement; Timber ; Aluminum as construction materials; Timber & Wood based materials ; Glass and ceramics; Paints and varnishes; Plastic materials ; Alloy & Metal; Insulating materials; Geo-Textile ; Lime and water proofing materials.

DETAIL DESCRIPTION

1 Various aspects of civil engineering materials.

- 1.1 Define civil engineering materials.
- 1.2 Mention the classification of civil engineering materials in civil technology

2 Stone

- 2.1 Define stones.
- 2.2 Mention geological, physical and chemical classification of stones.
- 2.3 List the characteristics of good stones for construction.
- 2.4 Describe the dressing of stones.
- 2.5 Describe the uses of stone in civil engineering field.

3 Brick & Hollow block.

- 3.1 Define bricks
- 3.2 Mention the raw materials of Bricks and properties of good bricks making earth.
- 3.3 Explain the Preparation of clay (manual/mechanically): Pug mill and Machine molding.
- 3.4 Explain the procedures of drying and burning bricks.
- 3.5 Mention the types of kilns: Bull's Trench Kiln & Hoffman's Kiln.
- 3.6 Explain the Size of Brick as per BNBC & PWD specification.
- 3.7 Explain Common testing of Bricks as per BNBC
Compressive strength, Water absorption, Efflorescence, Dimensional tolerance Test.
- 3.8 Define Special Bricks: Hollow Block & ceramic brick
- 3.9 Mention the uses of hollow block and ceramic brick
- 3.10 State the Advantage and disadvantage of hollow block and ceramic brick

4 Sand.

- 4.1 Classify sand according to their sources.
- 4.2 Mention the specifications of good sand.
- 4.3 Describe the purpose of grading of sand.
- 4.4 Mention the use of various grades of sand.

5 Cement.

- 5.1 Define cement.
- 5.2 Mention the Raw materials of cement & functions of various ingredients of cement.
- 5.3 Explain manufacture process of ordinary Portland cement, Flow diagram for wet and dry process.
- 5.4 Mention the properties and uses of ordinary Portland cement.
- 5.5 Explain the testing of cement as per BNBC : Strength of Cement , Fineness by sieving, Consistency, Soundness, Setting times.
- 5.6 Understand special cement and their uses.
- 5.7 Explain storage of cement.

6 Tiles

- 6.1 Define the following tiles: clay tiles, concrete tiles, Plastic tiles, Mosaic tiles, Marble tiles, Glazed tiles. Homogenous tiles
- 6.2 Explain the uses of different kinds of tiles.

7 Timber & Wood Based Products

- 7.1 Explain the classification of trees: Exogenous and Endogenous trees and their cross section.
- 7.2 Explain the various types of timber: Teak, Shilkarai, Mehegoni, Gamari, Teak Chambal, Mango, etc.
- 7.3 Mention the market forms of converted timber as per PWD.
- 7.4 Explain seasoning of Timber and method of seasoning.
- 7.5 Explain plywood; manufacturing plywood (brief description only), uses of plywood.
- 7.6 Explain the Veneers.
- 7.7 Define other wood based products, their brief description of manufacturing and uses.
- 7.8 Laminated board, block board, fiber board, MDF board, melamine board and gypsum board. Applications of boards in false ceiling and wall paneling.

8 Glass and Ceramics.

- 8.1 Mention the constituents of glass.
- 8.2 Define the various types of Glass as per use like: Plate glass, weird glass, Tempered glass, colored glass, fiber glass, formed glass, float glass.
- 8.3 Explain the properties of glass.
- 8.4 Mention the uses of glass
- 8.5 Mention the classification of ceramics.
- 8.6 Explain the properties of ceramics.
- 8.7 Mention the uses of ceramics in civil engineering field.

9 Paints and varnishes.

- 9.1 Understand the purpose and uses of paints.
- 9.2 Explain the different type of paints: Distemper, plastic paint, enamels paint, cement paint, weather coat paint for outside of the building.
- 9.3 Understand varnishes and polish types properties and their uses
- 9.4 Explain lacquers their properties and their uses
- 9.5 Define the method of Application of different types of paints.

10 Plastic

- 10.1 Define plastic.
- 10.2 Explain the list of raw materials for plastic.
- 10.3 Mention the type of properties of plastic.
- 10.4 Mention the characteristics of thermoplastic and thermosetting plastic.
- 10.5 Identify the uses of plastic as an engineering materials.
- 10.6 Define laminating plastic.

11 Alloy and Metals

- 11.1 Define the common types of iron used in industry.
- 11.2 Mention the uses of wrought iron and cast iron.
- 11.3 Mention the classification of steel on the basis of carbon content.
- 11.4 Define the Mild steel, alloy steel and stainless steel.
- 11.5 Mention the uses of non-ferrous metals and alloys like copper, zinc, tin, lead, brass and bronze.
- 11.6 Define light metal (aluminum/white metal) as construction material.
- 11.7 Mention the uses of aluminum as construction materials.

12 Insulating Materials

- 12.1 Define insulating materials
- 12.2 Make a list of insulating materials
- 12.3 State sound and thermal insulation
- 12.4 Mention the uses of insulation materials

13 Geo-textiles

- 13.1 Introduction to geo-textiles
- 13.2 Mention the Uses of geo-textiles
- 13.3 Describe the Advantage and disadvantage of geo-textiles

14.

Lime:

- 14.1 Define the lime
- 14.2 Mention the Uses of lime
- 14.3 List the Advantage and disadvantage of lime

15

Construction chemicals & Water proofing Materials

- 15.1 Define Construction chemicals/Admixture.
- 15.2 Make a list of construction chemicals
- 15.3 Mention the uses of construction chemicals
- 15.4 Define water proofing Materials.
- 15.5 Make a list of water proofing materials
- 15.6 Mention the uses of water proofing materials.

PRACTICAL:

1. Show skill in identifying various types of stone
 - 1.1. Select different type of stone in the laboratory.
 - 1.2. Grading of stone as aggregates
2. Show skill in field test of bricks
 - 2.1. Perform field test of bricks
 - 2.2. Select 1st class , 2nd class, 3rd class bricks and jhama bricks
3. Show skill in conducting laboratory test of bricks
 - 3.1. Perform:
 - (a) Compression test
 - (b) Absorption test
 - 3.2. Determine average weight of a brick.
4. Show skill in conducting laboratory test of cement

- 4.1. Conduct laboratory tests of cement
 - (a) Make cement paste of Normal Consistency(CPNC)
 - (b) Determine initial setting time
 - (c) Perform final setting time
 - (d) Perform compressive strength test
 - (e) Perform tensile strength test
 - (f) Perform fineness test
- 4.2. Conduct field tests of cement
5. Show skill in conducting test of sand
 - (a) Bulking of sand
 - (b) F M of sand
 - (c) Specific gravity of sand
6. Identify mild steel, cast iron, copper, and, aluminum, tin, by physical observation.
7. Identify Varies types of wood and artificial wood: Veneers , plywood, Laminated board, block board, fiber board and gypsum board.

REFERENCE BOOKS

- 1 A text book on Engineering Materials - G. J. Kulkarni
- 2 Engineering Materials - Dr. M. A. Aziz
- 3 Plastic Materials - J. A Brydson

65722

COMMUNICATIVE ENGLISH

T	P	C
1	3	2

Full Marks: 100 (Practical-50.Theoretical-50)

Introduction

This Course Will Provide A Unique Foundation In The Basic Level For Developing Listening, Speaking, Reading And Writing Skills Into Some Of More Specialized And Advanced Capabilities Of Basic Operation In Communication.

Theory Part

Total Mark:	:	50
Continuous Assessment	:	20
Final Exam	:	30

Objectives:

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

- # Creative Writing Ability
- # Transferring Information, Ideas And Knowledge
- # Communicative Competence Effectively In The Workplace Situation.

1.Comprehension For Reading Task (Mark:10)

(Text May Be Taken From Contemporary Journals, Editorial of News Papers Or From Online Resources)

Test Items:

1. MCQ (Guessing Meaning from Context)
2. Rearranging
3. Gap-Filling (With Clues or Without Clues)
4. Answering Questions
5. Summarizing

2. Composition (Mark: 20)

The Following Are The Topic Title Introduced For Writing Task:

1. Introduce Formal/Informal Greeting & Farewell
2. Describe The Idea Of Communication & Presentation Skills
3. Write Paragraph On The Basis Of Comparison and Contrast
4. Narrate Process, Stories And Interpreted Charts, Graphs.
5. Write Letters to the Print and Electronic Media
6. Write Letters of Advice, Complaints, Inquiry, Order and Cancellation
6. Prepare Seven Days Weather Report.
7. Make An Attractive Poster For The People Giving Advice To Protect The Environment.
8. Prepare A Series Of Questions About Personal Information, Place Of Interest, Foods, Hobby And Employment Opportunity.
9. Write Dialogue On The Following Situations
 - # About Exchanging Views With A Person And Introducing One Narrating Daily Activities
 - # Meeting At The Train Station & Asking Question About The Departure And Arrival Of The Train To The Station Manager
 - # Meeting at The Airport And Asking The Flight Schedule
 - # Getting To The Hotel And Asking For A Reservation
 - # Social Language for Telephonic Conversation
 - # Talking About the Weather, Trips & Sight Seeing
 - # Asking Permission and Making Request.
 - # Talking About Office and Office Manner
 - # Talking About Etiquette and Manner

10. Prepare Job Application With A Complete CV For Job Suitable For You.

Practical Part:

Objectives:

- 1. Communicate The Areas That Learners Encounter In Real Life Situation.**
- 2. Reinforce The Basic Language Skills Of Listening And Speaking.**
- 3. Integrate ICT As Tools In Learning Language.**

Course Content

Unit	Lesson	Title
1. Use Of Dictionary	Define Dictionary	1.1 Know How To Use A Dictionary 1.2 Learn At Least 10 Words In A Day With Correct Pronunciation (Follow The Link : Www.Marriuum-Englishdictionary.Com)
2. Basic Vocabulary Practice	Basic Words For Communication By ODGENS	2.1 Use 10 Most Common Formulas (Structure) To Write Correct Sentence. (Follow The Link: Www.Odgensbasicvocabulary.Com Www.Grammarly.Com)
3. Listening Skill Practice	Listen To The Audio Video Presentation On Current Real Life Situation	3.1 Practice Audio Video Conferencing Activities. 3.2. Communicate With The English Speaking People Online (Link: Www.Speaking24.Com)
4. Speaking Skill Practice (Self Interpretation)	Introduce Yourself With The Vocabulary Prescribed By ODGENS	4.1 Browse Vocabulary Related Phrases To Introduce You. (Link : Www.Youtube.Com/Let Me Introduce Myself)
5. Listening Skill Practice	Listen To The Weather Reports, Sports Commentary In The English TV Channels.	5.1 Prepare Seven Days Weather Report For The Place You Are Staying. 5.2. Make Some Attractive Poster To Protect The Environment.
6. Speaking Skill Practice	Identify Formal And Informal Social Language	6. 1 Practice Conversation Emphasizing On Greetings & Farewell (Link- Www.Esl.Guide@About.Com) 6.2 Take Part In Audio Video Conferencing Activities 6.3 Ask Questions About Personal Information, Place Of Interest, Food, Hobby, Employment Opportunity With Foreign Friends Using Social Media.
7. Writing Skill Practice	Develop Paragraph	7.1 Develop Paragraph On The Basis Of Comparison, Contrast And Analysis. Check Plagiarism Wordiness By The Correction Software (Www.Grammarly.Com) 7.2. Write E-Mail, Send And Reply E-Mail
8. Listening Skill Practice	Watch Short Films, Documentary And Listen To The English Music(With Lyric) To Practice In A Group	8.1 Listen To Hard Talk, Interview 8.2. Prepare A Series Of Questions To Interview A Celebrity 8.3. Down Load Documentary From Www.Youtube.Com/Education
9. Presentation	Define Presentation	9.1 Edutain/Entertain Yourself Preparing A Documentary In A Group With The Activities Done During The Period Of Class Hours In The Lab For Communicative English.

Evaluation:

Students Can Be Evaluated Individually Or In A Group On The Basis Of Performance Done In The Lab. Furthermore, They May Be Given Online Test Using Authenticated Websites Like Www.Britishcouncil.Org/Education/Blog/Podcast/News/Weather, Www.Englishteststore.Com, Www.Ieltsexam.Com

Lab-Facilitator, 30 Students In A Group:

Physical Facility	Size (In Ft)	Area (In Sq Ft)
Class Room Cum Laboratory	15 × 20	300
Library	15 × 20	300
Wash Room	4 × 7	28

Lists Of Equipments And Resources For 30 Learners:

Personal Computers With Accessories	15
Projector Multimedia	01
Printer	01
Scanner	01
Modem	01
Essential Software	01 Set
Internet Connection For Each Computer	Broad Band/Dial Up
Camera (Digital)	01
Video Conferencing Equipments	01 Set
TV Card	01
Satellite Cable Connection	01
Head Phone	15
Related Books And Journals	01
First Aid Box	01

Reference:

Www.Britishcouncil.Org, Www.Marium-Websters.Com, Www.Compellingconversation.Com,
Www.Esl.Guide@About.Com, Www.Bbc.Com/News, Www.Speaking24.Com, Www.Itutor.Com,
Www.Ieltsexam.Com, Www.Englishteststore.Com, Www.Ginger.Com, Www.Grammarly.Com

(Note: This Course May Be Introduced After Fourth Semester Coz It Needs Some Maturity Of The Students To Adopt With The Course Materials And The Contents. These Themes Are Suggestive Not Prescriptive.)

65921**MATHEMATICS -2**

T	P	C
3	3	4

OBJECTIVES

- To enable in solving the simultaneous equations with the help of determinant and matrix.
- To make understand the exponential series.
- To provide ability to apply the knowledge of differential calculus in solving problem like slope, gradient of a curve, velocity, acceleration, rate of flow of liquid etc.
- To enable to apply the process of integration in solving practical problems like calculation of area of a regular figure in two dimensions and volume of regular solids of different shapes.

SHORT DESCRIPTION

Algebra : Determinants, Matrix, Exponential Series.

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

Differential Calculus : Function and limit of a function, differentiation with the help of limit, differentiation of functions, geometrical interpretation of $\frac{dy}{dx}$, successive differentiation and Leibnitz theorem, partial differentiation.

Integral Calculus : Fundamental integrals, integration by substitutions, integration by parts, integration by partial fraction, definite integrals.

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

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

2 Apply the concept of matrix.

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

3 Understand exponential series.

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

TRIGONOMETRY

4 Apply the concept of inverse circular function.

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

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

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

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

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

4.5 Solve problems of the following types.

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

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

c) Prove that the area of the segment cut from a circle of radius r by a chord at a distance d from the centre is given by
$$K = r^2 \cos^{-1} \frac{d}{r} - d\sqrt{r^2 - d^2}$$

5 Apply the principle of properties of triangles.

- 5.1 Prove the followings identities :

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

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

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

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

- 5.2 Establish the followings.

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

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

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

- 5.3 Solve the problems of the following types:

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

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

DIFFERENTIAL CALCULUS

6 Understand the concept of functions.

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

7 Understand the concept of limits.

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

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

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

8 Understand differential co-efficient and differentiation.

8.1 Define differential co-efficient in the form of

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

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

9 Apply the concept of differentiation.

9.1 State the formulae for differentiation:

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

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

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

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

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

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

10.3 Solve the problems of the type:

A circular plate of metal expands by heat so that its radius increases at the rate of 0.01 cm per second. At what rate is the area increasing when the radius is 700 cm ?

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

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

11.2 Express Leibnitz's theorem

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

12 Understand partial differentiation.

12.1 Define partial derivatives.

12.2 State formula for total differential.

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

12.4 State Euler's theorem on homogeneous function.

12.5 Solve the problems of partial derivatives.

INTEGRAL CALCULUS

13 Apply fundamental indefinite integrals in solving problems.

13.1 Explain the concept of integration and constant of integration.

13.2 State fundamental and standard integrals.

13.3 Write down formulae for:

(i) Integration of algebraic sum.

(ii) Integration of the product of a constant and a function.

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

13.5 Solve problems of indefinite integration.

14 Apply the concept of definite integrals.

14.1 Explain definite integration.

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

14.3 Solve problems of the following types:

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

P* =Practical continuous assessment

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

65922

PHYSICS-2

T P C
3 3 4

OBJECTIVES

- To develop a foundation in scientific principles and processes for the understanding and application of technology.
- To develop an understanding of fundamental scientific concepts through investigation and experimentation.
- To provide a common base for further studies in technology and science.
- To develop the basic knowledge of modern physics.

SHORT DESCRIPTION

Thermometry and Heat Capacity; Expansion of materials (effect of heat); Heat transfer; Humidity; Nature of heat and Thermodynamics; Photometry; Reflection of light; Refraction of light; Electron , photon and Radio activity; Theory of Relativity.

DETAIL DESCRIPTION

THEORY

1. THERMOMETRY AND HEAT CAPACITY

- 1.1 Define heat and temperature.
- 1.2 Mention the units of measurement of heat and temperature.
- 1.3 Distinguish between heat and temperature.
- 1.4 Identify the range of the Celsius scale determined by the boiling point and melting point of water
- 1.5 State the construction and graduation of a mercury thermometer.
- 1.6 Define specific heat capacity, thermal capacity and water equivalent with their units.
- 1.7 Prove the total heat gained by an object is equal to the sum of the heat lost by all the surrounding objects.
- 1.8 Explain the principle of calorimetry.
- 1.9 Define various kinds of specific latent heat.
- 1.10 Determine the latent heat of fusion of ice and latent heat of vaporization of water.
- 1.11 Determine the specific heat of a solid by calorimeter.

2. EFFECT OF HEAT ON DIMENSION OF MATERIALS

- 2.1 Show that different materials change in size at different amounts with the same heat source.
- 2.2 Explain the meaning of differential expansion in bimetallic strip, thermostats, compensated pendulum etc.
- 2.3 Explain the methods of overcoming problems caused by the expansion of materials in buildings, machinery, railway lines and bridges.
- 2.4 Mention the units co-efficient of linear, superficial and cubical expansion of solids.
- 2.5 Define the co-efficient of linear, superficial and cubical expansion of solids.
- 2.6 Relation between the co-efficient of linear, superficial and cubical expansion of solids.
- 2.7 Define real and apparent expansion of liquid.
- 2.8 Relation between the real and apparent expansion of liquid.

3. HEAT TRANSFER

- 3.1 Identify the phenomena of heat transferring from hot bodies to cold bodies.
- 3.2 Explain the methods of heat transfer by conduction, convection and radiation with examples of each type of transfer.
- 3.3 Define thermal conductivity (K) and Co-efficient of thermal conductivity.
- 3.4 Find the unit and dimension of Co-efficient of thermal conductivity.
- 3.5 List the factors which determine the quantity of heat (Q) flowing through a material.
- 3.6 Show that the quantity of heat flowing through a material can be found from
$$Q = \frac{KA(\theta_H - \theta_C)t}{d}$$
- 3.7 State Stefan-Boltzman Law and Wien's law.
- 3.8 State Newton's law of cooling.
- 3.9 Explain Green house effect.

4. HUMIDITY

- 4.1 Define Standard Temperature and Pressure.
- 4.2 Define Humidity, Absolute Humidity, Relative Humidity and Dewpoint.
- 4.3 Relation between vapour pressure and air pressure.
- 4.4 Determine Humidity by wet and dry bulb hygrometer.
- 4.5 Explain few phenomena related to hygrometry.

5. NATURE OF HEAT AND THERMODYNAMICS

- 5.1 Describe the caloric theory and kinetic theory of heat.
- 5.2 Explain the mechanical equivalent of heat.
- 5.3 State and Explain the first law of thermodynamics .
- 5.4 Explain Isothermal and adiabatic change.
- 5.5 Explain Specific heat of a gas, Molar specific heat or molar heat capacity.
- 5.6 Relate between pressure and volume of a gas in adiabatic Change $i, e; PV^\gamma = \text{const.}$
- 5.7 State and Explain Reversible process and irreversible process.
- 5.8 State & explain 2nd law of thermodynamics
- 5.9 Entropy: Definition, unit and significant.
- 5.10 Explain Change of entropy in a reversible and irreversible process.
- 5.11 Give an example of increase of entropy in irreversible process.

6. PHOTOMETRY

- 6.1 Define light, medium (transparent, translucent, opaque), luminous & non-luminous bodies, parallel, convergent & divergent of rays.
- 6.2 Show the travel of light in straight line.
- 6.3 Define photometry, luminous intensity, luminous flux, brightness and illuminating power.
- 6.4 Mention relation between luminous intensity & illuminating power.
- 6.5 Explain inverse square law of light.
- 6.6 Describe the practical uses of light waves in engineering.

7. REFLECTION OF LIGHT

- 7.1 Define mirror (plane & spherical), image (real & virtual) and magnification of images.
- 7.2 Describe the reflection of light.
- 7.3 State the laws of reflection of light.
- 7.4 Express the verification of laws of reflection.
- 7.5 Define pole, principal axis, center of curvature, radius of curvature, principal focus in case of concave & convex mirrors.
- 7.6 Find the relation between focal length & radius of curvature of a concave & convex mirror.
- 7.7 Express the general equation of concave and convex mirror.

8. REFRACTION OF LIGHT

- 8.1 Define refraction of light Give examples of refraction of light
- 8.2 State the laws of refraction and Express the verification of laws of refraction
- 8.3 Define absolute and relative refractive index and Relate absolute and relative refractive index
- 8.4 Explain the meaning of total internal reflection and critical angle and Relate total internal reflection and critical angle.
- 8.5 Give examples of total internal reflection.
- 8.6 Describe refraction of light through a prism.
- 8.7 Express the deduction of the relation between refractive index, minimum deviation and angle of the prism.
- 8.8 Define lens and mention the kinds of lens.
- 8.9 Identify and List uses of lens.
- 8.10 Express the deduction of the general equation of lens (Concave & convex).

9. ELECTRON, PHOTON AND RADIO-ACTIVITY

- 9.1 Describe Electrical conductivity of gases.
- 9.2 Describe Discharge tube.
- 9.3 Cathode ray : Definition and its properties
- 9.4 X-ray : Definition, properties & uses
- 9.5 Discuss Photo electric effect .
- 9.6 Derive Einstein's photo electric equation
- 9.7 Define and explain radio-activity.
- 9.8 Describe radio-active decay law.
- 9.9 Define half-life and mean-life of radio-active atoms.
- 9.10 Define nuclear fission and fusion.

10. THEORY OF RELATIVITY

- 10.1 Define Space, time and Mass.
- 10.2 Define rest mass.
- 10.3 Express the theory of relativity.
- 10.4 Explain special theory of relativity and its fundamental postulate.
- 10.5 Mention different Kinds of theory of relativity.
- 10.6 The Relativity of Length - Length contraction.
- 10.7 The Relativity of Time – Time dilation.
- 10.8 Deduce Einstein's mass -energy relation

PRACTICAL

1. Compare the operation of common thermometers.
2. Determine the co-efficient of linear expansion of a solid by Pullinger's apparatus.
3. Measure the specific heat capacity of various substances.(Brass, steel).
4. Determine the latent heat of fusion of ice.
5. Determine the water equivalent by calorimeter.
6. Compare the luminous intensity of two different light sources.
7. Verify the laws of reflection.
8. Find out the focal length of a concave mirror.
9. Determine the refractive index of a glass Slab.
10. Determine the angle of Minimum deviation and refractive index of a glass prism by using I-D graph.

REFERENCE BOOKS:

- | | |
|-------------------------------------------|-----------------------------------|
| 1. Higher Secondary Physics – Second Part | - by Dr. Shahjahan Tapan |
| 2. A Text Book of Heat and Thermodynamics | - by N Subrahmanyam and Brij Lal |
| 3. A Text Book of Optics | - by N Subrahmanyam and Brij Lal |
| 4. Higher Secondary Physics -Second Part | - by Prof. Golam Hossain Pramanik |
| 5. Higher Secondary Physics -Second Part | - by Ishak Nurfungnabi |
| 6. Thermodynamics | - by K K Ramalingam |

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COMPUTER APPLICATION

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OBJECTIVES

- SHORT DESCRIPTION

DETAIL DESCRIPTION

1. Operate a personal Computer

1.1 Start up a Computer

- 1.1.1 *Peripherals* are checked and connected with system unit
- 1.1.2 Power cords / adapter are connected properly with computer and power outlets socket
- 1.1.3 Computer is switched on gently.
- 1.1.4 PC *desktop / GUI settings* are arranged and customized as per requirement.

1.2 Operate Computer

- 1.2.1 Files and folders are created.
- 1.2.2 Files and folders are *manipulated* as per requirement.
- 1.2.3 Properties of files and folders are viewed and searched.
- 1.2.4 Control panel settings are practiced.
- 1.2.5 *Memory devices* are formatted as per requirement.

1.3 Shutdown computer

- 1.3.1 unsaved file and folders are closed
- 1.3.2 Open software is closed and hardware devices are switched off.
- 1.3.3 Computer is switched off gently.
- 1.3.4 Power at the respective power outlets is switched off.

2. Type text and documents in English and Bangla.

2.1 Install the Typing Tutor software

- 2.1.1 Required *Hardware* and *software* are ready to use.
- 2.1.2 Typing tutor software are collected and selected
- 2.1.3 English Typing tutor software is installed.
- 2.1.4 Specialized Bangla Typing tutor software is installed.

2.2 Practice text typing in English and Bangla

- 2.2.1 Typing tutor software is started.
- 2.2.2 English Home key drilling are practiced systematically
- 2.2.3 Intermediate level typing speed(25 cps) are achieved.
- 2.2.4 Specialized Bangla Typing tutor / software are installed.
- 2.2.5 Bangla Home key typing are practiced systematically
- 2.2.6 Text documents are typed repeatedly for increasing typing speed.

2.3 Type documents

- 2.3.1 *Word processor* is started.
- 2.3.2 Text document are typed.
- 2.3.3 Intermediate level typing speed (30 cps) in English and (20 cps) in Bangla are achieved.

3. Operate Word Processing Application

3.1 Create documents:

- 3.1.1 Word-processing application are opened.
- 3.1.2 **Documents** are created.
- 3.1.3 Data are added according to information requirements.
- 3.1.4 Document templates Used as required.
- 3.1.5 Formatting tools are used when creating the document.
- 3.1.6 Documents are Saved to directory.

3.2 Customize basic settings to meet page layout conventions:

- 3.2.1 Adjust page layout to meet information requirements
- 3.2.2 Open and view different toolbars
- 3.2.3 Change **font format** to suit the purpose of the document
- 3.2.4 Change alignment and line spacing according to document information requirements
- 3.2.5 Modify margins to suit the purpose of the document
- 3.2.6 Open and switch between several documents

3.3 Format documents

- 3.3.1 Use formatting features and styles as required.
- 3.3.2 Highlight and copy text from another area in the document or from another active document
- 3.3.3 Insert headers and footers to incorporate necessary data
- 3.3.4 Save document in another **file format**
- 3.3.5 Save and close document to **a storage device**.

3.4 Create tables:

- 3.4.1 Insert standard table into document
- 3.4.2 Change cells to meet information requirements
- 3.4.3 Insert and delete columns and rows as necessary
- 3.4.4 Use formatting tools according to style requirements

3.5 Add images:

- 3.5.1 Insert appropriate **images** into document and customize as necessary
- 3.5.2 Position and resize images to meet document formatting needs

3.6 Print information and Shutdown computer:

- 3.6.1 **Printer** is connected with computer and power outlet properly.
- 3.6.2 Power is switched on at both the power outlet and printer.
- 3.6.3 Printer is installed and added.
- 3.6.4 Correct printer settings are selected and document is printed.
- 3.6.5 Print from the printer spool is viewed or cancelled and
- 3.6.6 Unsaved data is saved as per requirements.
- 3.6.7 Open software is closed and computer hardware devices are shut downed.
- 3.6.8 Power at the respective power outlets is switched off.

4. Operate Spreadsheet application

4.1 Create spreadsheets

- 4.1.1 Open spreadsheet application,
- 4.1.2 create spreadsheet files and enter numbers, text and symbols into cells according to information requirements
- 4.1.3 Enter **simple formulas and functions** using cell referencing where required
- 4.1.4 Correct formulas when error messages occur
- 4.1.5 Use a range of common tools during spreadsheet development
- 4.1.6 Edit columns and rows within the spreadsheet
- 4.1.7 Use the auto-fill function to increment data where required
- 4.1.8 Save spreadsheet to directory or folder

4.2 Customize basic settings:

- 4.2.1 Adjust page layout to meet user requirements or special needs
- 4.2.2 Open and view different toolbars
- 4.2.3 Change font settings so that they are appropriate for the purpose of the document
- 4.2.4 Change **alignment** options and line spacing according to spreadsheet **formatting features**
- 4.2.5 **Format** cell to display different styles as required
- 4.2.6 Modify margin sizes to suit the purpose of the spreadsheets
- 4.2.7 View multiple spreadsheets concurrently

4.3 Format spreadsheet:

- 4.3.1 Use formatting features as required
- 4.3.2 Copy selected formatting features from another cell in the spreadsheet or from another active spreadsheet
- 4.3.3 Use **formatting tools** as required within the spreadsheet
- 4.3.4 Align information in a selected cell as required
- 4.3.5 Insert headers and footers using formatting features
- 4.3.6 Save spreadsheet in another format
- 4.3.7 Save and close spreadsheet to **storage device**

4.4 Incorporate object and chart in spreadsheet:

- 4.4.1 Import an object into an active spreadsheet
- 4.4.2 Manipulate imported **object** by using formatting features
- 4.4.3 Create a chart using selected data in the spreadsheet
- 4.4.4 Display selected data in a different chart
- 4.4.5 Modify chart using formatting features

4.5 Create worksheets and charts

- 4.5.1 Worksheets are created as per requirement
- 4.5.2 Data are *entered*
- 4.5.3 **Functions** are used for calculating and editing logical operation
- 4.5.4 **Sheets** are formatted as per requirement.
- 4.5.5 **Charts** are created.
- 4.5.6 Charts/ Sheets are previewed.

4.6 Print spreadsheet:

- 4.6.1 Preview spreadsheet in print preview mode
- 4.6.2 Select basic printer options
- 4.6.3 Print spreadsheet or selected part of spreadsheet
- 4.6.4 Submit the spreadsheet to **appropriate person** for approval or feedback

5. Operate Presentation Package:

5.1 Create presentations:

- 5.1.1 Open a presentation package application and create a simple design for a presentation according to organizational requirements
- 5.1.2 Open a blank presentation and add text and graphics
- 5.1.3 Apply existing styles within a presentation
- 5.1.4 Use presentation template and slides to create a presentation
- 5.1.5 Use various **Illustrations** and **effects** in presentation
- 5.1.6 Save presentation to correct directory

5.2 Customize basic settings:

- 5.2.1 Adjust display to meet user requirements
- 5.2.2 Open and view different **toolbars** to view options
- 5.2.3 Ensure **font settings** are appropriate for the purpose of the presentation
- 5.2.4 View multiple slides at once

5.3 Format presentation:

- 5.3.1 Use and incorporate organizational charts, bulleted lists and modify as required
- 5.3.2 Add **objects** and manipulate to meet presentation purposes
- 5.3.3 Import **objects** and modify for presentation purposes
- 5.3.4 Modify slide layout, including text and colors to meet presentation requirements
- 5.3.5 Use **formatting tools** as required within the presentation
- 5.3.6 Duplicate slides within and/or across a presentation
- 5.3.7 Reorder the sequence of slides and/or delete slides for presentation purposes
- 5.3.8 Save presentation in another **format**
- 5.3.9 Save and close presentation to disk

5.4 Add slide show effects:

- 5.4.1 Incorporate preset animation and multimedia effects into presentation as required to enhance the presentation
- 5.4.2 Add slide transition effects to presentation to ensure smooth progression though the presentation
- 5.4.3 Test presentation for overall impact
- 5.4.4 Use onscreen navigation tools to start and stop slide show or move between different slides as required

5.5 Print presentation and notes:

- 5.5.1 Select appropriate print format for presentation
- 5.5.2 Select preferred slide orientation
- 5.5.3 Add notes and slide numbers
- 5.5.4 Preview slides and spell check before presentation
- 5.5.5 Print the selected slides and submit presentation to appropriate person for feedback

6. Access Information using Internet and electronic mail

- 6.1 Access resources from internet
 - 6.1.1 Appropriate internet **browsers** are selected and installed
 - 6.1.2 Internet browser is opened and web address / URL is written/selected in /from address bar to access **information**.
 - 6.1.3 **Search engines** are used to access information
 - 6.1.4 Video / Information are Shared /downloaded / uploaded from / to web site/**social media**.
 - 6.1.5 **Web based resources** are used.
 - 6.1.6 Netiquette' (or web etiquette) principles are searched and followed

6.2 Use and manage Electronic mail

- 6.2.1 **Email services** are identified and selected to create a new email address
- 6.2.2 Email account is created
- 6.2.3 Document is prepared, attached and sent to different types of recipient.
- 6.2.4 Email is read, forwarded, replied and deleted as per requirement.
- 6.2.5 Custom email folders are created and **manipulated**
- 6.2.6 Email message is printed

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Electronics Engineering Fundamental

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OBJECTIVES

- To provide understanding soldering technique and color code.
- To provide understanding and skill on the basic concept of semiconductor and to identify physically a range of semiconductor diodes.
- To develop comprehensive knowledge and skill on special diodes and devices.
- To develop the abilities to construct different rectifier circuits.
- To provide understanding of the basic concept and principle of transistor and to identify physically a range of transistor.
- To provide understanding and skill on oscillator.
- To provide the understanding skills on Multivibrator.

SHORT DESCRIPTION

Color code and soldering; Semiconductor; P-N junction diode; Special diodes and devices; Power supply; Transistor; Transistor amplifier; Oscillator, Multivibrator.

DETAIL DESCRIPTION

Theory:

1 Soldering and Color Code.

- 1.1 Define soldering.
- 1.2 List the materials needed in soldering.
- 1.3 Mention the properties of a good soldered joint.
- 1.4 Multi layered Printed circuit board.
- 1.5 Mention the function of resistor, capacitor and inductor in electronic circuits.
- 1.6 Describe the procedure of determining the value of Capacitor, & Resistor using numeric and color code.

2 Semiconductor

- 2.1 Define Conductor, Semiconductor and Insulator.
- 2.2 Describe Semiconductor with atomic structure.
- 2.3 Explain the energy band diagram of Conductor, Semiconductor and Insulator.
- 2.4 Classify Semiconductor.
- 2.5 Describe the formation of P-type & N-Type Semiconductor material.
- 2.6 Explain the majority & minority charge carrier of P-type & N-Type Semiconductor.

3 P-N Junction Diode

- 3.1 Define PN junction diode
- 3.2 Describe the formation of depletion layer in PN junction.
- 3.3 Mention the behavior of PN junction under forward and reverse bias.
- 3.4 Explain the forward & reverse current voltage (IV) characteristics of PN junction diode.
- 3.5 Describe the operation of Zener diode.
- 3.6 Describe the application of Zener diode in voltage stabilization.
- 3.7 Describe the construction operation and application of (i) varactor diode (ii) LED (iii) LCD (viii) photo diode (ix) Solar cell.
- 3.8 Describe the construction operation and application of (i) DIAC (ii) TRIAC and (iii) SCR.

4 DC power supplies.

- 4.1 Define (i) dc power supply (ii) Regulated and Unregulated Power Supply.
- 4.2 Describe the block diagram of a typical regulated dc power supply.
- 4.3 Explain the operation of Half wave, Full wave and Bridge rectifier.
- 4.4 Mention ripple factor of Half wave, Full wave and Bridge rectifier.
- 4.5 Explain the operation of different types filter circuits with wave shape.

5 Bipolar Junction Transistor (BJT)

- 5.1 Define Transistor.
- 5.2 Describe the construction PNP and NPN Transistor.
- 5.3 State the biasing rules of BJT.
- 5.4 Explain the mechanism of current flow of PNP and NPN Transistor.
- 5.5 Draw the three basic transistor configuration circuits (CB, CC, CE).
- 5.6 Describe the characteristics of transistor in CB, CE, CC configuration.
- 5.7 Describe current amplification factor α , β and γ .
- 5.8 Establish the relation among α , β and γ .
- 5.9 Solve problem related to I_E , I_C , I_B , α , β and γ .

6 Transistor biasing and load line.

- 6.1 Mention the needs for biasing of transistor
- 6.2 State the conditions for proper biasing of transistor.
- 6.3 Describe the methods of drawing load line of transistor.
- 6.4 Explain the Effect of the location of operating point on the output signal.
- 6.5 Describe the various methods of transistor biasing.

7 Transistor Amplifier

- 7.1 Define (i) Amplifier (ii) Amplification and (III) Gain
- 7.2 Mention the classification of Amplifier.
- 7.3 Describe the principle of operation of a single stage common emitter (CE) Amplifier.
- 7.4 Draw DC & AC equivalent circuits of the CE amplifier circuit.
- 7.5 Explain the operation of RC coupled and transformer coupled multistage amplifier.
- 7.6 Describe the operation of Push-Pull amplifier.

8 Field-Effect Transistor(FET).

- 8.1 Define field effect transistor(FET).
- 8.2 Mention the types of FET
- 8.3 Describe the construction and operation Junction Field Effect Transistor (JFET).
- 8.4 Explain characteristics of JFET .
- 8.5 Describe the parameters of JFET .
- 8.6 Establish the relationship among FET parameters.
- 8.7 Describe the DC biasing of JFET and its load line.
- 8.8 Describe the Construction and operation of DE and E-Only MOSFET.

9. Sinusoidal Oscillators.

- 9.1 Define feedback
- 9.2 Describe different types of feedback with block diagram.
- 9.3 Calculate the gain of amplifier with feedback (positive and negative).
- 9.4 Mention the advantages and disadvantages of negative feedback.
- 9.5 Explain the principle of operation of a oscillatory tank circuit.
- 9.6 Describe the essentials of feedback LC oscillators.
- 9.7 Explain the principle of operation of Hartly, Colpitt and Wein-bridge oscillators.
- 9.8 Explain the principle of operation phase shift & crystal oscillators.

10. Multivibrator circuits.

- 10.1 Define time base circuit.
- 10.2 Mention the methods of generating time base waveform.
- 10.3 Explain the generation of saw-tooth wave using charging and discharging of a capacitor.
- 10.4 Understand the features of multivibrator circuits.
- 10.5 State what is meant by multivibrator.
- 10.6 Explain the operation of astable, monostable and bistable multivibrator circuits with wave shapes.
- 10.7 Mention the principle of operation of Schmitt trigger circuit.

Practical: (Using Real component and Simulation Software)

1 Show skill in identifying the electronic components.

- 1.1 Observe the electronic components board and read the manuals.
- 1.2 Identify the different types of resistors with their values, tolerance and wattage.
- 1.3 Identify the different types of potentiometers with their values, & wattage.
- 1.4 Identify the different types of capacitors with their values, dc working voltages and types.
- 1.5 Identify the different types of diodes & rectifiers with the numbers and specifications.
- 1.6 Identify the different types of transistors and thyristors with their number and specifications.
- 1.7 Identify the different types of LED's, IC's and miniature relays with their number & specification.
- 1.8 Identify different types of transformer with their specification.
- 1.9 Identify different inductors with their values & current ratings.
- 1.10 Study the printed circuit boards.
- 1.11 Sketch the symbols of components used in electronic circuits.
- 1.12 Describe the basic function of each component.
- 1.13 Write a report on above activities.

2 Show skill for determining the values of different resistors and capacitors with the help of color code.

- 2.1 Select color code resistors & capacitors of different values.
- 2.2 Identify the colors and their numerical numbers.
- 2.3 Determine the value of resistors with tolerance.
- 2.4 Determine the value of capacitors and dc working voltage.
- 2.5 Write a report on above activities.

3 Show skill in performing soldering.

- 3.1 Select wires (single strand and multi strand) and cut wires to required length.
- 3.2 Select soldering iron, soldering tag and soldering lead.
- 3.3 Remove wire insulation to required length.
- 3.4 Clean and tin both iron and work piece.
- 3.5 Use a tinned iron in order to transfer adequate heat to the joint.
- 3.6 Joint two singles& multi stranded wires mechanically and solder.

4 Show skill in soldering & de-soldering of electronic components and wires to the other components and circuit boards.

- 4.1 Select electronic components, wires and PCB.
- 4.2 Determine the rating of the soldering iron suitable for the work piece.
- 4.3 Clean and tin both iron & work piece.
- 4.4 Feed new soldering materials to the tinned and heated joint, in order to produce a correctly soldering.
- 4.5 Check the quality of soldering.
- 4.6 Clean and tin iron and de-solder the joint and components.
- 4.7 Use solder suckers and solder braid for de-soldering.
- 4.8 Write a report on the Job.

5 Show skill in checking the semi-conductor diode.

- 5.1 Collect a range of semi-conductor diodes and manufactures literature.
- 5.2 Select the digital multi-meter and set the selector switch to ohm range.
- 5.3 Determine the specification of semi-conductor diode.
- 5.4 Compare the determined specification with that of manufactures literature.
- 5.5 Measure forward & reverse resistances of the diode.
- 5.6 Identify p and p side of the diode.
- 5.7 Determine the condition of the diode.

- 6 Show skill in sketching forward and reverse characteristics curves of a semiconductor diode.**
- 6.1 Select meter, power supply, components and materials.
 - 6.2 Complete circuit according to circuit diagram for forward bias.
 - 6.3 Check all connections.
 - 6.4 Measure forward bias and corresponding forward current.
 - 6.5 Record results in tabular form.
 - 6.6 Connect circuit according to circuit diagram of reverse bias.
 - 6.7 Measure reverse bias and corresponding reverse current.
 - 6.8 Record results in tabular form.
 - 6.9 Sketch the curves from data.
- 7 Show skill in sketching waves of half wave rectifier circuit.**
- 7.1 Select meter, component, oscilloscope and materials.
 - 7.2 Complete circuit of a half wave rectifier according to circuit diagram.
 - 7.3 Check the circuit before operation.
 - 7.4 Measure the input and output voltage and observe wave shapes in the oscilloscope.
 - 7.5 Sketch the output voltage wave shape.
- 8 Show skill in sketching waves of full wave center tapped rectifier circuit.**
- 8.1 Select meter, component, oscilloscope and materials.
 - 8.2 Complete a full wave rectifier circuit according to circuit diagram.
 - 8.3 Check the circuit supply & polarity of supply.
 - 8.4 Measure the input & output voltages and observe wave shapes in the oscilloscope.
 - 8.5 Sketch the output voltage wave shape.
 - 8.6 Compare the result with half-wave rectifier circuit.
- 9 Show skill in constructing full wave bridge rectifier.**
- 9.1 Select meter, component, oscilloscope and materials.
 - 9.2 Build the circuit according to the circuit diagram.
 - 9.3 Check the circuit.
 - 9.4 Measure the input and output voltage.
 - 9.5 Observe wave shape.
 - 9.6 Compare the result with other rectifiers.
- 10 Show skill in identifying the terminals of bipolar junction transistor.**
- 10.1 Select pnp & npn bipolar junction transistors.
 - 10.2 Take AVO meter and manufacturer's literature of transistor.
 - 10.3 Identify transistor legs.
 - 10.4 Measure base-emitter, base-collector, forward and reverse resistance.
 - 10.5 Determine the specifications with help of manufacturer's literatures.
 - 10.6 Identify pnp & npn transistor.
- 11 Show skill in determining input and output characteristics of a transistor in common emitter connection.**
- 11.1 Select component, AVO meters, circuit board and required materials.
 - 11.2 Construct the circuit.
 - 11.3 Adjust the biasing voltage to appropriate point.
 - 11.4 Record input and output voltage and current.
 - 11.5 Plot the curve with recorded data.
- 12 Show skill in measuring operating points (VCE and IC) for Transistor circuit.**
- 12.1 Select a fixed bias transistor circuit materials.
 - 12.2 Select required equipment.
 - 12.3 Prepare the circuit.
 - 12.4 Check the connections
 - 12.5 Adjust the circuit.

- 13. Demonstrate the operation of a Hartly, Colpitt and R-C oscillator.**
- 13.1 Draw the circuit diagram.
 - 13.2 Select tools, equipment and materials.
 - 13.3 Connect the circuit diagram.
 - 13.4 Check and energize the circuit.
 - 13.5 Observe the output for different frequencies
- 14. Study the operation of a transistor astable, monostable& bi-stable multivibrator circuit.**
Select an experiment circuit.
- 14.1 Select the required tools and materials.
 - 14.1 Build up the circuit as per diagram.
 - 14.1 Switch on the power supply.
 - 14.1 Switch on the trigger signal.
 - 14.1 Observe the wave shapes at each collector & base of the transistor

REFERENCE BOOKS :

- 1. A Text Book of Applied Electronics - R.S. SEDHA
- 2. Principles of Electronics - V. K. Mehta

OBJECTIVES

- To enhance body fitness.
- To make aware of First Aid Procedure.
- To acquaint with the Common games and sports.
- To develop Life Skill.

SHORT DESCRIPTION

Warm up; Yoga; Muscle developing with equipment; Meditation, First aid; sports science, Games & sports; Life skill development.

DETAIL DESCRIPTION

1. National Anthem and Assembly

- 1.1 Line and File.
- 1.2 Make assembly.
- 1.3 Recitation of national anthem.
- 1.4 National anthem in music.

2. Warm up

2.1 General Warm-up :

Spot running (Slow, Medium & Fast), Neck rotation, Hand rotation, Side twisting, Toe touching, Hip rotation, Ankle twisting, Sit up and Upper body bending (Front & Back).

2.2 Squad Drill :

Line, File, Attention, Stand at easy, Stand easy, Left turn, Right turn, About turn, Mark time, Quick march, Right wheel, Left wheel, Open order march & Closed order march.

2.3 Specific warm up :

Legs raising one by one, Leg raising in slanting position, Knee bending and nose touching, Heels raising, Toes touching (standing and laying position), Hand stretch breathing (Tadasana, Horizontal, Vertical).

2.4 Mass Physical Exercise

Hand raising, Side twisting, Front & back bending, Front curl, Straight arm curl two hand, Hands raising overhead and Push up.

3. Yoga

- 3.1 Dhyanaasan : Shabasan, Padmasan, Gomukhasan, Sharbangasan, shashangasan Shirhasan
- 3.2 Shasthyasan : Halasan, Matshasan, Paban Muktasan, Ustrasan.
- 3.3 Prana and Pranayama: Nadiisuddhi Pranayama, cooling pranayamas (sitali pranayama, Sitkari Pramayama, sadanta pranayama), Ujjayi pranayama,

4. Muscle Developing with equipment

- 4.1 Damball : Front curl, Hand sidewise stretching, Arms raising overhead.
- 4.2 Barball : Front press, Leg press, Rowing motion with leverage bar.
- 4.3 Rope climbing : Straight way climbing, Leg raising climbing.
- 4.4 Horizontal bar : Chinning the bar with front grip, Chinning the bar with wide back grip.
- 4.5 Jogging Machine : Slow, Medium, and Fast running.
- 4.6 A. B king pro (Rowing Machine): Sit up.
- 4.7 Sit up bench: Sit up.

5 Meditation

- 5.1 Define meditation.
- 5.2 Classification of Meditation.

- 5.3 Nadanusandhana (A-Kara chanting, U-Kara chanting, M-Kara chanting, AUM-kara chanting).
- 5.4 OM-Meditation.
- 5.5 Cyclic Meditation (Starting Prayer, Instant Relaxation Technique, Centring, Standing Asanas, Sitting Asanas, Quick Relaxation Technique).

6. First Aid

- 6.1 Define First Aid.
- 6.2 What do you mean by First Aider.
- 6.3 Discuss the responsibilities of a First Aider.
- 6.4 Different types of equipment of First Aid.
- 6.5 Muscle Cramp-Ice application (Remedy).
- 6.7 Dislocation-Ice application (Remedy).

7. Rules and Technique of games and sports

- 7.1 Kabadi.
- 7.2 Football.
- 7.3 Cricket.
- 7.4 Badminton.
- 7.5 Athletics.
- 7.6 Swimming.

8. Sports Science

- 8.1 Definition of Exercise physiology.
- 8.2 Function of muscles.
- 8.3 Concept of work, energy and power.
- 8.4 Effect of exercise on heart and circulatory system.
- 8.5 Motor components for physical fitness.
- 8.6 Definition of sports Biomechanics.
- 8.7 Definition of sports psychology.
- 8.8 Meaning of nutrition, Diet and Balanced diet.
- 8.9 Meaning of the terms –Test, measurement and Evaluation.

9. Show skill on conversation on day to day life

- 9.1 Today's Market price.
- 9.2 Festivals(religious festivals, National festivals).
- 9.3 Celebration of National days.
- 9.4 Aim in life.
- 9.5 Visited historical places/sites.

10. Human relation

- 10.1 Family relation.
- 10.2 Relation with neighbour.
- 10.3 Humanitarian Service.
- 10.4 Service for handicapped (intelligent, physical, social etc).
- 10.5 Service for orphan / Patient.

11. Vote of appreciation

- 11.1 About dress .
- 11.2 For good work.
- 11.3 For good result.
- 11.4 For good news.

12. Stress Management

- 12.1 Habit to be a man of humor.
- 12.2 Always brain should be cool.
- 12.3 Positive thinking.
- 12.4 Factors that determine our attitude.
- 12.5 The benefits of a positive attitude.
- 12.6 Steps to building a positive attitude.

13 Time Management

- 13.1 Determine essential time for a task.
- 13.2 Determine delay and unexpected time.
- 13.3 Determine time for daily activities .
- 13.4 Plan for daily activities.

14 Interview Technique

- 14.1 Mental preparation to face an interview.
- 14.2 Selection of dress for interview.
- 14.3 Introducing himself/herself to the interviewer .
- 14.4 Coping interview.

15 Team work

- 15.1 Organized a team.
- 15.2 Selection of team leader.
- 15.3 Distribution the task to the members.
- 15.4 Accepting opinion of team members.
- 15.5 Completion of task as a team.

16 Social work

- 16.1 Tree plantation.
- 16.2 Community service.
- 16.2.1 Rover Scout.
- 16.2.2 Sanitation.
- 16.2.3 Pure drinking water.
- 16.2.4 Social Culture.

Reference Book

Modern Yoga _Kany Lal Shah

Rules of games and sports_ Kazi Abdul Alim

Yoga _ Sobita Mallick

Iron Man_ Nilmoni Dass



BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207.

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

CIVIL TECHNOLOGY
TECHNOLOGY CODE: **664**

3rd SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

CIVIL TECHNOLOGY (664)

3rd SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total	
						Theory		Practical			
						Cont. assess	Final exam	Cont. assess	Final exam		
1	66431	Civil Engineering Drawing- 1	1	6	3	20	30	50	50	150	
2	66432	Surveying-1	2	3	3	40	60	25	25	150	
3	66433	Construction Process-1	2	3	3	40	60	25	25	150	
4	66434	Civil Workshop Practice	0	3	1	0	0	25	25	50	
5	65931	Mathematics-3	3	3	4	60	90	50	0	200	
6	65913	Chemistry	3	3	4	60	90	25	25	200	
7	65811	Social Science	3	0	3	60	90	0	0	150	
Total			14	21	21	280	420	200	150	1050	

66431**CIVIL ENGINEERING DRAWING - I**

T	P	C
1	6	3

AIMS

- To enable to understanding civil engineering drawing scale.
- To prepare simple building drawing
- To assist to understand the code & symbols used in civil engineering drawing .
- To enable to learning detail drawing of building components.
- To enable in learning detail drawing of different types of foundation, culvert, Road & truss.

SHORT DESCRIPTION:

Civil engineering drawing scale, drawing of single storied building, code and symbols used in drawing; Detail drawing of different types of foundation ,flooring system in/c beam & slab, road, doors & windows, steel structure .

DETAIL DESCRIPTION:**THEORY :****1 Understand the basic principles of engineering drawing scale.**

- 1.1 Define scale.
- 1.2 Identify & select the scale of FPS & MKS system.
- 1.3 State the need & importance of scale.

2 Understand the components of a single storied building.

- 2.1 Identify the name of different parts of building.
- 2.2 Define line plan of a building.
- 2.3 Describe the plan over plinth of simple building.
- 2.4 Explain the necessity of drawing, plan, elevation and section of building.

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

- 3.1 State the use of code and symbols in drawing.
- 3.2 Explain the necessity of covering for steel reinforcement according to code.
- 3.3 Describe the significance of minimum thickness & size of structural member according to code.
- 3.4 Explain the necessity of hooks, bend and lapping as per code.
- 3.5 Define construction joint and expansion joint as per code.

4 Understand the significance of detail drawing.

- 4.1 Define the meaning of detail drawing.
- 4.2 Mention the necessity of detail drawing.
- 4.3 List different types of foundation.
- 4.4 List different types of RCC footing.
- 4.5 List different types of flooring system.

5 Understand the features of pile.

- 5.1 Define the terms pile.
- 5.2 Mention the functions of pile cap.
- 5.3 List different types of piles used.
- 5.4 Explain the necessity of piles grouping.

6 Understand the features of doors and windows.

- 6.1 List different types of doors.
- 6.2 Label different parts of doors.
- 6.3 List different types of windows.
- 6.4 Label different parts of windows.

7 Understand the features of road

- 7.1 List different types of road.
- 7.2 List different types of joints in rigid pavement.
- 7.3 State the meaning of right of way.
- 7.4 Identify different components of a rigid pavement.
- 7.5 Identify different components of a flexible road.

8 Understand the features of steel structure.

- 8.1 Define steel structure with truss & I- Joist.
- 8.2 Define the term truss.
- 8.3 Label different parts of a wooden truss.
- 8.4 Label different parts of a steel truss.
- 8.5 Distinguish between king post and queen post truss.
- 8.6 Define I-Joist.
- 8.7 Label different parts of a building made by I-Joist.
- 8.8 Define the steel structure joints with rivets & welding.
- 8.9 Define the flooring system of steel structure with decking panel & its fixing system.

PRACTICAL:

1 Prepare drawing of a single storied building with verandah

- 1.1 Draw the line plan of a single storied simple building with verandah.
- 1.2 Draw plan over plinth of simple building with verandah from the line plan as started in 2.1.
- 1.3 Draw front and side elevation of the simple building started in 2.2
- 1.4 Draw the cross section of simple building as started in 2.2
- 1.5 Assemble plan over plinth, sections and elevations of simple building with proper dimensions, heading and title block in proper places on one sheet according to given data.
- 1.6 Draw the isometric view of a given single roomed building showing front and one side elevation.

2 Apply different types of code in civil engineering drawing.

- 2.1 Use the different types of design code.
- 2.2 Use clear cover of different component of building for protection of reinforcement according to code.
- 2.3 Use anchorage of reinforcement according to code.
- 2.4 Use minimum thickness of structural members according to code.
- 2.5 Use minimum width of beam and least dimension of column according to code.
- 2.6 Use minimum requirement of reinforcement in footing, column, beam & slab according to code.

3 Apply different symbols in civil engineering drawing.

- 3.1 Draw the standard hooks and bends according to code.
- 3.2 Draw the compression joints in reinforcement bar.
- 3.3 Draw the tensile joints in reinforcement bars.
- 3.4 Prepare a bar-schedule with specification of reinforcement bars.
- 3.5 Draw the construction, expansion & contraction joints.

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

- 4.1 Draw the brick spread foundation for load bearing wall with the given data or rule of thumb in/c showing of offsets & position of DPC.
- 4.2 Draw the details of basement floor showing damp proofing system.
- 4.3 Draw the brick wall with RCC footing , Grade beam & Floor beam.
- 4.4 Draw the RCC continuous (inverted T-beam) footing.
- 4.5 Draw the RCC cantilever footing.

5 Prepare the detail drawing of pile and pile cap.

- 5.1 Draw the detail drawing of RCC cast-in-situ piles.
- 5.2 Draw sections of a square pre-cast RCC pile.
- 5.3 Draw the cross-section of a pile cap over a group of piles.
- 5.4 Draw the shoe of a pile.

6 Construct detail drawing of floor.

- 6.1 Draw timber floor.
- 6.2 Draw typical cement concrete (CC) floor over single brick flat soling.
- 6.3 Draw the typical reinforced cement concrete (RCC) floor.

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

- 7.1 Draw the elevation of a paneled door.
- 7.2 Draw horizontal section of paneled door cutting plane passing through panels.
- 7.3 Draw vertical section of paneled door cutting plane passing through panels.
- 7.4 Draw the horizontal cross-section and elevation of metal window.
- 7.5 Draw the horizontal and vertical section of a fully glazed window.

8 Prepare the detail drawing of road.

- 8.1 Draw the right of way of a national highway in the embankment.
- 8.2 Draw the cross-section of bituminous road on embankment showing foundation details.
- 8.3 Draw the cross-section of rigid pavement on embankment showing foundation details.

9 Prepare detail working drawing of wooden truss.

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

10 Prepare working drawing of steel truss.

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

11 Prepare the drawing of plan, elevation and section of a single storied steel building.

- 11.1 Draw a plan of a two storied steel building using I-Joist.
- 11.2 Draw the elevation of a two storied steel building using I- Joist .
- 11.3 Draw the section of a two storied steel building using I-joist and decking panel as floor system.
- 11.4 Draw the section of folded decking panel floor system in/c RCC slab resting on decking panel

REFERENCE BOOKS

- 1. Structural Detailing** - Peter H Newton
- 2. Civil Engg. Drawing** - Guru Charan Sing

66432**Surveying- 1**

T	P	C
2	3	3

Objectives

To provide the students with an opportunity to acquire knowledge and skills about:

1. Conduct the survey work with chain and compass and plane table.
2. Conduct cadastral survey.
3. Record surveyed data and plot the surveyed area.
4. Enlarge or reduce the map and calculate the area by using small instrument.

Short Description

Introduction to surveying; chain surveying; Compass surveying; Plane table surveying; Cadastral surveying.

DETAIL DESCRIPTION

Theory:

1. The concepts of surveying

- 1.1 Explain the meaning of surveying
- 1.2 Discuss the purpose of surveying.
- 1.3 Classify Primary divisions of survey.
- 1.4 Explain field work.
- 1.5 Explain office work.
- 1.6 Acquaint with survey instruments and their care and adjustment.
- 1.7 Discuss the classification of surveying based of shape of earth nature of field object of surveying and instrument employed.
- 1.8 Differentiate plane survey and geodetic survey.

2. The basic principle of chain surveying.

- 2.1 Describe the purpose and scope of chain surveying.
- 2.2 Describe basic principle of chain surveying.
- 2.3 Explain chain line, base line, tie line, check line, station points.
- 2.4 Explain ill-conditioned and well conditioned triangle.
- 2.5 Rules to be observed while chaining.

3. The main instrument used in chain surveying.

- 3.1 List the equipment and accessories used in chain surveying.
- 3.2 Describe Gunter's chain, Engineer's chain, meter chain, ranging rod, cross-staff, offset rod, plumb-bob, arrows, tapes, whites.
- 3.3 Explain the method of folding and unfolding a chain.
- 3.4 Describe the use of steel band chain.
- 3.5 Describe the use of linen, steel and invar tape.
- 3.6 Explain the use of arrows, ranging rod, offset rod, cross-staff, prism square, box-sextant, clinometer.

4. Use optical square.

- 4.1 Describe the principle of optical square.
- 4.2 Explain the construction and use of optical square.
- 4.3 Explain the procedure of checking and adjustment of optical square.

5. Procedure of chain surveying.

- 5.1 Explain reconnaissance surveying.
- 5.2 Describe the procedure of chain surveying.
- 5.3 State the considerations of selecting station points.
- 5.4 Describe the procedure of ranging of survey line.
- 5.5 Distinguish between direct and indirect ranging.
- 5.6 Describe the procedure of indirect ranging (reciprocal ranging) on sloping ground.
- 5.7 Describe the procedure of measuring linear distances with the help of chain and tape.

6. Measuring offset.

- 6.1 Define offset perpendicular offset and oblique offset.
- 6.2 Describe the procedure of measuring offset by offset rod and tape.
- 6.3 Describe the procedure of measuring offset by optical square.
- 6.4 Describe the different methods of locating unknown points with reference to two known points.

7. The booking procedure of field book.

- 7.1 State single line and double line field book.
- 7.2 Describe the procedure of booking in a single line field book.
- 7.3 Describe the procedure of booking in a double line field book.
- 7.4 Describe precautions in booking field notes.

8. Chaining across obstacles.

- 8.1 Describe the procedure of setting out perpendicular by chain and tape when the point is accessible.
- 8.2 Describe the procedure of setting out perpendicular by chain and tape when the point is inaccessible.
- 8.3 Describe the procedure of chaining across obstacles when the chaining obstructed.
- 8.4 Describe the procedure of chaining across obstacles when the vision obstructed
- 8.5 Describe the procedure of chaining across obstacles when both chaining and vision obstructed.

9. Errors in chaining.

- 9.1 List the errors in chaining.
- 9.2 Identify the causes for which a chain may be too-long or too-short.
- 9.3 Calculate the correct distance and correct area from measured distance and measured area when the chain was too-long or too-short.
- 9.4 Explain cumulative and compensating errors with causes of those errors.
- 9.5 List the mistakes in chain surveying.
- 9.6 List the name of necessary correction to be applied to the measured length of a line in order to obtain its true length.
- 9.7 Explain the formula for correction of tapes for absolute length, variation of temperature, variation of pull, sag and slope.
- 9.8 Computer correct length of line after necessary correction due to variation of pull, sag and slope.
- 9.9 Explain normal tension.
- 9.10 Explain degree of accuracy in chaining.
- 9.11 Discuss about precise of linear measurements.

10. Chain survey map.

- 10.1 List the instrument and materials required for plotting a survey map.
- 10.2 Discuss different types of scale.
- 10.3 State suitable scale for plotting a map.
- 10.4 Describe the procedure of plotting a survey map from field book.
- 10.5 Draw conventional symbols used in plotting maps.

11. Different methods of computing areas.

- 11.1 Describe the units of measurements in plane surveying.
- 11.2 Describe different methods of computing areas within regular and irregular perimeters.
- 11.3 Carry out the field work for calculation of areas within regular and irregular perimeters.
- 11.4 Compute the area along boundary by mid-ordinate rule, average ordinates rule, trapezoidal rule, and Simpson's rule.

12. The methods of calculation of area from a given map.

- 12.1 Describe the procedure of computation of area from a map with the help of planimeter.
- 12.2 Calculate an area with the help of planimeter.
- 12.3 Describe the procedure of computation of area from a map analytically by dividing the map into triangles, squares, trapezoids (Parallel lines).
- 12.4 Calculate an area from a map analytically.
- 12.5 Describe the procedure of computation of area from a given map with the help of acre comb.
- 12.6 Calculate an area from a map with the help of acre comb.

13. Understand about small instruments.

- 13.1 State the use of planimeter.
- 13.2 State the use of pantograph.
- 13.3 State the use of acre comb.
- 13.4 Describe the procedure of reducing and enlarging a map with the help of pantograph.
- 13.5 Describe the procedure of measuring angle of elevation and depression with the help of abney level.

- 14. Basic terms used in compass surveying.**
- 14.1 Describe the purpose and scope of compass surveying.
 - 14.2 List the instrument and accessories required for compass survey.
 - 14.3 Define terms- meridian, true meridian, magnetic meridian, arbitrary meridian, bearing, true bearing, magnetic bearing, arbitrary bearing, magnetic declination, dip of the needle, deflected angle, exterior angle, interior angle.
 - 14.4 State the method to determine the direction of meridian by sun's shadow.
 - 14.5 State the method to determine the direction of magnetic meridian by compass needle.
- 15. Conversion of bearing.**
- 15.1 Explain for bearing and back bearing.
 - 15.2 Compute back bearing from fore bearing and fore bearing from back bearing.
 - 15.3 Explain whole circle bearing and reduced bearing and necessity of converting them.
 - 15.4 Convert whole circle bearing to reduced bearing and reduced bearing to whole circle bearing.
- 16. The procedure of compass surveying.**
- 16.1 Describe prismatic, surveyors and trough compass.
 - 16.2 Differentiate prismatic and surveyors compass.
 - 16.3 State the use of different compass.
 - 16.4 Describe the procedure of compass survey.
 - 16.5 Define local attraction.
 - 16.6 Detect local attraction and correct the observed bearings.
- 17. Basic concept of plane table surveying.**
- 17.1 State the purpose and scope of plane table surveying.
 - 17.2 List the instruments and accessories required for plane-table survey.
 - 17.3 Describe the procedure of setting up plane table.
 - 17.4 Explain the term orientation.
 - 17.5 Describe orientation by magnetic needle and back sighting.
 - 17.6 Name the methods of plane table survey.
 - 17.7 Describe radiation, intersection, traversing and resection methods.
 - 17.8 Define two points problem.
 - 17.9 Define three points problem.
 - 17.10 Describes the advantages and disadvantage of plane table survey.
- 20. Basic concept of cadastral survey.**
- 20.1 Define cadastral survey.
 - 20.2 Define the purpose of cadastral survey.
 - 20.3 Identify scale used in cadastral survey.
 - 20.4 List the equipment and accessories used in cadastral survey.
 - 20.5 Define the terms Quadrilaterals, intersections, shikmi, chanda, check line, field khaka, revenue survey, revisional settlement.
 - 20.6 State the stages of cadastral survey.
 - 20.7 Explain the procedure of preparing a cadastral survey map.
 - 20.8 Describes the rules for numbering the plots.
- 21. Identify the boundary of property.**
- 21.1 Describe the procedure for demarcation of boundary lines of property.
 - 21.2 Describe the procedure for locating of lost boundary.

Practical:

1. Identify the different instruments and accessories required for chain survey.
2. Test and adjust chain.
3. Measure length of line by chain and tape.
4. Set perpendiculars with the help of chain and tape.
5. Set parallel lines with chain and tape.
6. Test and adjust an optical square.
7. Set perpendiculars with the help of optical square.
8. Measure distances across obstacles.

9. Conduct a chain survey of a field.
10. Prepare a chain survey map.
11. Calculate the area of map with the help of planimeter.
12. Identify the different instruments and accessories required in compass survey.
13. Measure magnetic bearing by prismatic and surveyors compass.
14. Identify the different instruments and accessories required in plane table survey.
15. Locate the position to point with the help of plane table.
16. Plot the map of a place by radiation, intersection and traversing.
17. Locate the position of the instrument station of the plan of the plane table by solving three points problem.
18. Locate the position of the instrument station on the plan of the plane table by solving three points problem.
19. Calculate the area from a map with the help of planimeter graphically and analytically.
20. Enlarge a given map up to the desired size with the help of pantograph.
21. Reduce a given map up to the desired size with the help of pantograph.
22. Calculate the angle of elevation and angle of depression with the help of abney level.
23. Measure the area of a plot from mouza map.
24. Locate the position of a point in the field which is already plotted on the mouza map.
25. Locate the boundary line of a property with the help of chain, tape and plane table which is already plotted on the mouza map.

Reference Book:

1. Surveying and Levelling - T. P. Kanatker
2. Surveying - Norman Thomas
3. Surveying - Aziz & Shahjahan
4. Plane & Geodetic Survey - D. Clark
5. Surveying - B. C. Punmia
6. Text book of surveying - S.K.Husain, M.S Nagraj.

66433

CONSTRUCTION PROCESS-I

T P C
2 3 3

OBJECTIVES:

At the end of course the students will be able to:

- Apply relevant theory and practice of concrete construction and its quality control methods.
- Perform skills for construction work and its supervision.
- understand the process, techniques and materials used in different types of masonry.

SHORT DESCRIPTION

Concrete, Brick masonry, Composite masonry, Foundation, Partition wall, Cavity wall.

DETAIL DESCRIPTION

Theory:

1 Understand the features of concrete.

- 1.1 State the meaning of concrete.
- 1.2 Mention the different Types of concrete.
- 1.3 List the uses of concrete in the construction industry.
- 1.4 List the ingredients of different Types of concrete.
- 1.5 Mention the functions of ingredients of concrete.
- 1.6 Mention the advantages and limitations of concrete.
- 1.7 Write the characteristics of materials used in concrete.

2 Understand the properties of concrete.

- 2.1 Define the terms: strength, durability, workability, laitance and segregation.
- 2.2 State the meaning of water-cement ratio.
- 2.3 List the factors affecting the strength of concrete.
- 2.4 List the factors affecting the durability of concrete.
- 2.5 List the factors affecting the workability of concrete.
- 2.6 Describe the effect of water-cement ratio on the strength of concrete.

3 Understand the techniques of proportioning, mixing, transporting, placing and compaction of concrete.

- 3.1 Explain the significance of proportioning the ingredients of concrete.
- 3.2 List the methods of concrete mix design.
- 3.3 Describe how batching of concrete mix is achieved by volume and weight.
- 3.4 Compare the various processes used to mix concrete.
- 3.5 Describe the ready mix concrete.
- 3.6 Mention the advantages and limitations of ready mix concrete.
- 3.7 State the various methods of transporting concrete.
- 3.8 Mention the sequence of placing concrete in different situations.
- 3.9 Describe the processes of compaction of concrete.

4 Understand the concept of curing of concrete.

- 4.1 Define of deferent type of concrete.
- 4.2 State the meaning of curing.
- 4.3 State how the curing process affects the strength of hardened concrete.
- 4.4 Describe the different methods of curing.
- 4.5 Mention the advantages and limitations of various methods of curing.

5 Understand the features of different special types of concrete.

- 5.1 Compare the properties of polymer concrete and super plasticized concrete.
- 5.2 Mention the procedure used in the production of Ferro-cement construction.
- 5.3 Explain the term pre-stressed concrete.
- 5.4 Mention the procedure used in the production of pre-stressed concrete.

6 Understand the supervisory aspects of concrete construction.

- 6.1 List the special precautions to be observed for concreting under water.
- 6.2 List the special precautions to be observed for concreting in cold weather.
- 6.3 List the special precautions to be observed for concreting in hot weather.
- 6.4 List the factors to be considered while supervising good quality concrete production.
- 6.5 List the factors to be considered while supervising good quality RCC construction.
- 6.6 List the factors to be considered while supervising good quality pre-stressed concrete construction.

7 Understand the aspects of foundation :

- 7.1 Define the terms of 'foundation, deep foundation, shallow foundation'.
- 7.2 Types of different foundation.
- 7.3 Draw the sketches of strip footing, wide strip footing, eccentrically loaded footing, raft foundation, combined footing, stepped strip foundation, grillage foundation.
- 7.4 Describe the following methods of casting and placing concrete pile foundation:
 - a. Cases cast-in-situ concrete pile.
 - b. Uncases cast-in-situ concrete pile.
 - c. Pre-cast concrete pile.

8 Understand the features of brick masonry.

- 8.1 State the meaning of brick masonry.
- 8.2 List the tools required for brick masonry.
- 8.3 State the specific uses of brick masonry tools.
- 8.4 Distinguish among different types of masonry structures.
- 8.5 Define the following terms: header, stretcher, lap, course, bed, joint, closer.
- 8.6 Identify the defects in brick masonry.
- 8.7 List the factors to be considered while supervising brick masonry works.

9 Understand the purpose of bond in brick masonry.

- 9.1 State the meaning of bond in brick masonry.
- 9.2 Mention the functions of good brick bonding.
- 9.3 Describe the steps for brick lying.
- 9.4 Identify different types of bonds in brick masonry.
- 9.5 Draw the neat sketches of different types of bonds in brick masonry.
- 9.6 Differentiate between English and Flemish bond.
- 9.7 Describe the bonding arrangements around openings and corners.

10 Understand the features of composite masonry.

- 10.1 State the meaning of composite masonry.
- 10.2 Identify different types of composite masonry.
- 10.3 Sketch details of brick backed stone slab masonry.
- 10.4 Mention the advantages and limitations of using reinforced brick masonry.
- 10.5 Mention the advantages and limitations of hollow clay block masonry.

11 Understand the features of partition wall.

- 11.1 State the meaning of partition wall.
- 11.2 Mention the common requirement of partition walls.
- 11.3 Mention the functions of partition wall.
- 11.4 List different types of partition walls.
- 11.5 Describe the procedure of construction of the following types of partition walls:
 - a. Brick partition wall
 - b. Concrete partition wall
 - c. Glass partition wall
 - d. Aluminum partition wall
 - e. Light weight partition wall(timber stud work, Ferro-cement plate, hollow blocks)
- 11.6 Mention the advantages and limitations of each type of partition walls.
- 11.7 Differentiate among the load bearing (main) walls and partition walls.

12 Understand the features of cavity wall.

- 12.1 State the meaning of cavity wall.
- 12.2 Explain the necessity of cavity wall construction.
- 12.3 Sketch the general features of cavity walls.
- 12.4 Mention the advantages and limitations of cavity walls over solid brick walls.
- 12.5 Identify different types of wall ties used in cavity wall.
- 12.6 Determine the spacing of wall ties in used in cavity wall.
- 12.7 Describe the construction procedure of cavity wall.
- 12.8 Mention the precautions to be taken while construction of cavity wall.

Practical:

- 1 Draw the grading curves for various samples of aggregates and find out the FM value.
- 2 Perform slump test of different concrete works.

- 3 Conduct cube test for concrete and interpret the results.
- 4 Conduct cylinder test for concrete and interpret the results.
- 5 Conduct brick masonry work to erect pillars of sizes 25 cm x 25 cm to 50 cm x 50 cm with English bond up to 5 layers .
- 6 Perform brick masonry work to erect pillars of sizes 25 cm x 25 cm to 50 cm x 50 cm with Flemish bond up to 5 layers.
- 7 Construct sample corner (L) joints of 25 cm to 50 cm width English bond brick wall up to 5 layers.
- 8 Construct sample corner (L) joints of 25 cm to 50 cm width Flemish bond brick wall up to 5 layers.
- 9 Construct sample tee (T) joints of 25 cm to 50 cm width English bond brick wall up to 5 layers.
- 10 Construct sample tee (T) joints of 25 cm thick wall with 50 cm thick wall Flemish bond brick wall up to 5 layers.
- 11 Construct sample cross (+) joints of 25 cm to 37.5 cm width English bond brick wall.
- 12 Construct sample cross (+) joints of 12.5 cm to 25 cm width Flemish bond brick wall.

REFERENCE BOOKS

- | | | |
|---|-----------------------|----------------------------|
| 1 | Building construction | Dr. B C Punmia |
| 2 | Building construction | G J Kulkarni |
| 3 | Building construction | S P Aurora and S P Brindra |

66434**CIVIL WORKSHOP PRACTICE****T P C**
0 3 1**AIMS**

To provide the students with an opportunity to acquire knowledge and skills to

- Perform Occupational Safety and Health (OSH) practice in wood shop.
- Make Hazard report in wood shop.
- Wood shop machines, tools, equipment.
- Perform different carpentry work in wood shop.
- Take care of wood working machine, tools and equipments.

SHORT DESCRIPTION

Wood working: Occupational Safety and Health (OSH)practice, common hand tools, measuring instrument, cutting , planning and finishing of wood piece, making different types of joint, finishing of the joint in wood shop.

Practical :

- 1 Observe the safety procedure, occupational safety and health(OSH) in wood shop:**
 - 1.1 State general safety precaution in wood shop (OSH) practice.
 - 1.2 Familiar to use important PPE (Personal Protective Equipment) in wood shop.
- 2 Demonstrate the application of basic wood working hand tools.**
 - 2.1 Identify common and basic hand tools required in carpentry works.
 - 2.2 Use basic hand tools required to undertake a simple carpentry exercise.
 - 2.3 Carryout minor maintenance and sharpening of tools used for wood works.
 - 2.4 Follow safety procedure during working in the wood shop.
 - 2.5 Clean work place and store tools and equipment.
- 3 Demonstrate the application of measuring instruments for wood works.**
 - 3.1 List & identify the measuring and layout tools.
 - 3.2 Take measurement with folding rule, steel rule and steel tape.
 - 3.3 Measure and Mark of wood works as required.
 - 3.4 Check the measurement of wood works.
- 4 Apply the process of layout.**
 - 4.1 Explain the necessity of layout
 - 4.2 Calculate materials required for a given job.
 - 4.3 Observe the safe procedure in laying out work pieces.
- 5 Show skill in sawing, planning and cutting of wood piece.**
 - 5.1 Identify the operations (different types of sawing).
 - 5.2 Perform different types of sawing on different parts
 - 5.3 Follow safety procedures during sawing.
 - 5.4 Identify the planning tools for required job.
 - 5.5 Follow the procedure of planning.
 - 5.6 Select the right size and types of cutting tools.
 - 5.7 Observe the safe procedure for cutting.
 - 5.8 Clean work place and store tools and equipments.
- 6 Show skill in making different types of wood joint.**
 - 6.1 Name the different types of joint used in wood work.
 - 6.2 Select appropriate size of wood used in the job.
 - 6.3 Select tools and equipment for the specific job.
 - 6.4 Put marking the wood for jobs.(As per Drawing)
 - 6.5 Make cross lap joint, T-halving joint, tenon and mortise joint, half lap dovetail joints corner dove tail joint.
 - 6.6 Make hole in wood, counter shank and wood joint with screw and nailing.
 - 6.7 Clean work place and store tools and equipments.
- 7 Apply polish to wooden furniture.**
 - 7.1 Identify common materials used in polish on wooden surface.
 - 7.2 Select sand paper of different grads.
 - 7.3 Perform sand papering on wooden surface.
 - 7.4 Apply putty on wooden surface.

- 7.5 Show the procedure of polish.
- 7.6 Apply polish along the grain of wood.
- 7.7 Clean work place and store tools and equipments.

8 Apply the basic rules of free hand sketching of furniture.

- 8.1 Identify the required materials for free hand sketching
- 8.2 Draw working drawing of the following furniture.
 - a. Tool
 - b. Book self
 - c. Office desk
 - d. Reading table
 - e. Armless chair

9 Prepare a complete job as project work (simple wooden furniture sitting Tool, Book self, Office desk, Reading table, Armless chair)

- 9.1 Perform one of the following furniture with costing/ including finishing work(varnishing / Lacquer)
 - a. Tool
 - b. Book self
 - c. Office desk
 - d. Reading table
 - e. Armless chair

9.2 Clean work place , store tools and equipments.

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65931**MATHEMATICS -3**

T	P	C
3	3	4

AIMS

- To enable to calculate the areas of regular polygons, hexagons, octagon, hydraulic mean depth (HMD) of a channel, area occupied by water of circular culvert. Excavation work.
- To provide the ability to calculate volume of regular solids like pyramid frustum of pyramid, prismoid, wedge and area of curved surfaces.
- To enable to use the knowledge of gradient of a straight line in finding speed, acceleration etc.
- To enable to use the knowledge of conic in finding the girder of a railway bridge, cable of a suspension bridge and maximum height of an arch.
- To make understand the basic concept and techniques of composition and resolution of vectors and computing the resultant of vectors.

- **SHORT DESCRIPTION**

Menstruation : Area of rectangles, squares, triangles, quadrilaterals, parallelograms, rhombus, trapezium, circle, sector, segment; Volume of rectangular solids, prism, parallelepiped, pyramids, cones, spheres, frustum of pyramid and cone; Area of curved surface of prism, Cylinder cone, pyramid and frustum of cone.

Co-ordinate Geometry: Co-ordinates of a point, locus and its equation, straight lines, circles and conic.

Vector: Addition and subtraction, dot and cross product.

DETAIL DESCRIPTION**MENSURATION:****1 Apply the concept of area of triangle.**

1.1 Find the area of triangle in the form,

i) $A = \frac{\sqrt{3}}{4} a^2$, a = length of a side of equilateral triangle.

ii) $A = \frac{c}{4} \sqrt{4a^2 - c^2}$, where a = length of equal sides, c = third side.

iii) $A = \sqrt{s(s-a)(s-b)(s-c)}$, where a, b, c = length of the sides of a triangle and $2s$ is the perimeter of the triangle.

1.2 Use formula in 1.1 to solve problems.

2 Apply the concept of finding areas of quadrilateral & Parallelogram & finding areas of rhombus & trapezium.

2.1 Define quadrilateral & Parallelogram.

2.2 Find the areas of quadrilateral when off sets are given.

2.3 Find the areas of a parallelogram.

2.4 Solve problems using above formulae.

2.5 Define rhombus & trapezium.

2.6 Find the areas of rhombus when the diagonals are given.

2.7 Find the areas of trapezium in terms of its parallel sides and the perpendicular distance between them.

2.8 Solve problems related to rhombus & trapezium.

3 Apply the concept of finding areas of regular polygon.

3.1 Define a regular polygon.

3.2 Find the area of a regular polygon of n sides, when

i) The length of one side and the radius of inscribed circle are given.

ii) The length of one side and the radius of circumscribed circle are given.

3.3 Find the area of a regular.

a) Hexagon

b) Octagon when length of side is given.

- 3.4 Solve problems of the followings types:
A hexagonal polygon 6 m length of each side has a 20 cm width road surrounded the polygon.
Find the area of the road.

4 Understand areas of circle, sector and segment.

- 4.1 Define circle, circumference, sector and segment.
4.2 Find the circumference and area of a circle when its radius is given.
4.3 Find the area of sector and segment of a circle.
4.4 Solve problems related to the above formulae.

5 Apply the concept of volume of a rectangular solid.

- 5.1 Define rectangular solid and a cube.
5.2 Find geometrically the volume of a rectangular solid when its length, breadth and height are given.
5.3 Find the volume and diagonal of a cube when side is given.
5.4 Solve problems with the help of 6.2 & 6.3.

6 Apply the concept of surface area, volume of a prism, parallelepiped and cylinder.

- 6.1 Define a prism, parallelepiped and a cylinder.
6.2 Explain the formulae for areas of curved surfaces of prism, parallelepiped and cylinder.
6.3 Explain the formulae for volume of prism, parallelepiped and cylinder when base and height are given.
6.4 Solve problems related to 7.2, 7.3.

7 Apply the concept of the surface area, volume of pyramid, cone and sphere.

- 7.1 Define pyramid, cone and sphere.
7.2 Explain the formula for areas of curved surfaces of pyramid, cone and sphere.
7.3 Explain the formula for volumes of pyramid, cone and sphere.
7.4 Solve problems related to 8.2, 8.3.

CO-ORDINATE GEOMETRY

8 Apply the concept of co-ordinates to find lengths and areas.

- 8.1 Explain the co-ordinates of a point.
8.2 State different types of co-ordinates of a point.
8.3 Find the distance between two points (x_1, y_1) and (x_2, y_2) .
8.4 Find the co-ordinates of a point which divides the straight line joining two points in certain ratio.
8.5 Find the area of a triangle whose vertices are given.
8.6 Solve problems related to co-ordinates of points and distance formula.

9 Apply the concept of locus & the equation of straight lines in calculating various Parameter.

- 9.1 Define locus of a point.
9.2 Find the locus of a point.
9.3 Solve problems for finding locus of a point under certain conditions.
9.4 Describe the Equation $x=a$ and $y=b$ and slope of a straight line.
9.5 Find the slope of a straight line passing through two point (x_1, y_1) , and (x_2, y_2) .
9.6 Find the equation of straight lines:
(i) Point slope form.
(ii) Slope Intercept form.
(iii) Two points form.
(iv) Intercept form.
(v) Perpendicular form.
9.7 Find the point of intersection of two given straight lines.
9.8 Find the angle between two given straight lines.
9.9 Find the condition of parallelism and perpendicularity of two given straight lines.
9.10 Find the distances of a point from a line.

10 Apply the equations of circle, tangent and normal in solving problems.

- 10.1 Define circle, center and radius.
- 10.2 Find the equation of a circle in the form:
 - (i) $x^2 + y^2 = a^2$
 - (ii) $(x - h)^2 + (y - k)^2 = a^2$
 - (iii) $x^2 + y^2 + 2gx + 2fy + c = 0$
- 10.3 Find the equation of a circle described on the line joining (x_1, y_1) and (x_2, y_2) .
- 10.4 Define tangent and normal.
- 10.5 Find the condition that a straight line may touch a circle.
- 10.6 Find the equations of tangent and normal to a circle at any point.
- 10.7 Solve the problems related to equations of circle, tangent and normal.

11 Understand conic or conic sections.

- 11.1 Define conic, focus, Directorx and Eccentricity.
- 11.2 Find the equations of parabola, ellipse and hyperbola.
- 11.3 Solve problems related to parabola, ellipse and hyperbola.

VECTOR :**12 Apply the theorems of vector algebra.**

- 12.1 Define scalar and vector.
- 12.2 Explain null vector, free vector, like vector, equal vector, collinear vector, unit vector, position vector, addition and subtraction of vectors, linear combination, direction cosines and direction ratios, dependent and independent vectors, scalar fields and vector field.
- 12.3 Prove the laws of vector algebra.
- 12.4 Resolve a vector in space along three mutually perpendicular directions
- 12.5 Solve problems involving addition and subtraction of vectors.

13 Apply the concept of dot product and cross product of vectors.

- 13.1 Define dot product and cross product of vectors.
- 13.2 Interpret dot product and cross product of vector geometrically.
- 13.3 Deduce the condition of parallelism and perpendicularity of two vectors.
- 13.4 Prove the distributive law of dot product and cross product of vector.
- 13.5 Explain the scalar triple product and vector triple product.
- 13.6 Solve problems involving dot product and cross product.

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02	Murary R Spigel	Vector & Tensor Analysis	Schaum's Outline Series
03	Md. Abu Yousuf	Vector & Tensor Analysis	Mamun Brothers
04	Rahman & Bhattacharjee	Co-ordinate Geometry & Vector Analysis	H.L. Bhattacharjee
05	Md. Nurul Islam	Higher Mathematics	Akkhar Patra Prakashani

65913**CHEMISTRY****T P C
3 3 4****Objectives:**

1. To Understand Mole Concept And Volumetric Analysis.
2. To Represent The Formation Of Bonds In Molecules.
3. Able To Select Appropriate Materials Used In Construction.
4. Apply Knowledge To Enhance Operative Life Span Of Engineering Material And Structure By Various Protective Methods.

Short Description: Chemistry Is A Basic Science Subject Which Is Essential To All Engineering Courses. It Gives Knowledge Of Engineering Material, Their Properties Related Application And Selection Of Material For Engineering Application. It Is Intended To Teach Student The Quality Of Water And Its Treatment As Per The Requirement And Selection Of Various Construction Materials And Their Protection By Metallic And Organic Coatings. The Topics Covered Will Provide Sufficient Fundamental As Well As Background Knowledge For The Particular Branch.

Section - 01 (Physical and Inorganic Chemistry)**1. Atomic Structure and Chemical Bond**

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1.1 Definition of Element, Atoms, Molecules, Fundamental Particle of Atom, Their Mass, Charge,
1.2 Definition of Atomic Number, Mass Number, Isotope, Isotone and Isobar. | Location. |
| 1.3 Electronic Configuration Based on Hunds Rule, Aufbau's Principle, Paulis Exclusion Principle | |
| 1.4 Definition Of Atomic Weight, Equivalent Weight of An Element, Molecular Weight, Mole In
of Number, Mass, Volume. | Terms |
| 1.5 Define Symbol, Valency And Formula. | |
| 1.6 Explain Chemical Bond, Octet Rule. | |
| 1.7 Explain Formation of Various Types of Chemical Bonds: Covalent, Ionic, Co-Ordinate Bond. | |
| 1.8 Explain The Bonding Along With Example CH ₄ , H ₂ , O ₂ , NaCl, MgCl ₂ . | |
| 1.9 Explain Quantum Number, Orbit And Orbital. | |

2. Ionic Equilibrium

- 2.1 Concept of Acid, Base, Salt and Types Of Salts.
- 2.2 Ph, Poh, Ph Scale.
- 2.3 Basicity of An Acid and Acidity of A Base.
- 2.4 Normality, Molarity, Molality, Volumetric Analysis.
- 2.5 Titration and Indicator.
- 2.6 Buffer Solution and Its Mechanism.

3. Chemical Reaction, Oxidation and Reduction.

- 3.1 Define Chemical Reaction And Explain The Various Type Of Chemical Reaction.
- 3.2 Explain The Full Meaning Of A Chemical Equation.
- 3.3 Concept of Catalyst.
- 3.4 Modern Concept of Oxidation and Reduction.
- 3.5 Simultaneous Process of Oxidation and Reduction.
- 3.6 Explain The Oxidation Number.

4. Water Treatment

- 4.1 Concept of Hard And Soft Water
- 4.2 Hardness of Water
- 4.3 Describe The Softening Method Of Permuted Process And Ion Exchange Resin Process.
- 4.4 Advantage and Disadvantage of Hard Water in Different Industries.
- 4.5 Water Treatment Plant Visit and Reporting.

5. Corrosion And Alloy

- 5.1 Types of Corrosion. (Dry and Wet Corrosion)
- 5.2 Atmospheric Corrosion, Types Of Atmospheric Corrosion And Their Mechanism, Oxide Films Factors Affecting Atmospheric Corrosion.
- 5.3 Electrochemical Corrosion, Mechanism of Electrochemical Corrosion.Types of Electrochemical Factors Affecting Electrochemical Corrosion.
- 5.4. Protective Measures Against Corrosion: Coating (Galvanic and Zinc, Organic Coating Coating Agents, Electroplating, Metal Cladding)
- 5.5 Concept of Alloy.

Section -2 (Organic Chemistry)

6. Organic Chemistry and Introduction to Polymers:

- 6.1 Types of Chemistry.
- 6.2 Catenation Property of Carbon.
- 6.3 Organic Compounds, Its Properties and Applications.
- 6.4 Classification of Organic Compound By Structure and Functional Group: Definne: Homologous Series, Alkanes, Alkenes and Alkynes; Properties And Uses of General Formula ; Names and Structure of First Five Members Hydrocarbons .
- 6.5 Polymer, Monomer, Classification of Polymers, Polymerization, Addition and Condensation Polymerization.
- 6.6 Plastics: Definition, Its Types and Uses.

Section -3 (Industrial Chemistry)

7. Glass and Ceramic:

- 7.1 Concept of Glass and Its Constituents, Classification and Uses of Different Glass, Elementary Idea Manufacturing Process of Glass.
- 7.2 Introduction to Ceramic Materials, Its Constituent.
- 7.3 Industrial Application of Glass and Ceramic.
- 7.4 Industry Visit and Reporting.

8. Soap and Detergent:

- 8.1 Introduction - A. Lipid B. Fats and Oils
- 8.2 Saponification of Fats and Oils, Manufacturing Of Soap.
- 8.3 Synthetic Detergent, Types of Detergents and Its Manufacturing.
- 8.4 Exclusives: TNT, RDX, Dynamite.
- 8.5 Paint and Varnish
- 8.6 Adhesives.

9. Cement, Pulp And Papers:

- 9.1 Concept of Cement and Its Constituents, Classification and Uses of Different Cement, Manufacturing Process Of Cement.
- 9.2 Manufacturing Process of Pulp and Papers.
- 9.3 Industry Visit and Reporting.

Section - 4 (Practical Chemistry)

1. Use Of Laboratory Tools And Safety Measures
2. **Observation And Measurement :**
 - 2.1 Determine the Strength of HCl Solution Using 0.1N Na₂CO₃
 - 2.2 Determine The Strength of NaOH By Using 0.1N HCl Solution.
3. **Qualitative Analysis Of Known And Unknown Salts :**
 - 3.1 Identification of Known Salt (Sample Copper, Iron, Aluminum, Lead, Ammonium and Zinc Salt.)
 - 3.2 Identification of Unknown Basic Radical (E.G. Lead, Copper, Iron, Zinc, Aluminum, Ammonium)
 - 3.3 Identification of Unknown Acid Radicals (E.G. Chloride, Nitrate, Sulphate, Carbonate)

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4. Organic Chemistry- Writer Morrisson And Boyad.
5. Inorganic Chemistry - Writer Ali Haider

65811

SOCIAL SCIENCE

T P C
3 0 3

OBJECTIVE

To provide opportunity to acquire knowledge and understanding on :

- importance of civics and its relationship with other social sciences
- The relationship of an individual with other individuals in a society
- social organizations, state and government
- rule of law, public opinion and political parties
- UNO and its roles
- The basic concepts and principles of economics and human endeavor in the economic system.
- The realities of Bangladesh economy and the current problems confronting the country.
- The role of Diploma Engineers in industries.
- our motherland and its historical background
- good citizenship through practicing our socio- economic culture
- liberation war and its background
- nationalism and life style of the nation

SHORT DESCRIPTION

Civics and Social Sciences; Individual and Society; Nation and Nationality; Citizenship; state and government; Law; Constitution; Government and its organs; public Opinion; Political Party; UNO and its organs; Scope and importance of Economics; Basic concepts of Economics- Utility, Wealth, Consumption, income wages, salary, value in use and savings; Production – meaning, nature, factors and laws; Demand and Supply; market equilibrium, national income, Current economic problems of Bangladesh; Role of Diploma Engineers in the economic development of Bangladesh; Occupations and career planning; Engineering team.

Part-1 (Civics)

1. Understand the meaning and scope of civics and inter relations of social sciences.

- 1.1 Define civics and social science.
- 1.2 Explain the importance of civics in the personal and social life of an individual.
- 1.3 Describe the relationship of all social science (civics, Economics, political science, Sociology, ethics)

2. Understand the relationship of the individual with the society, Nationality and nation, Rights and duties of a citizen.

- 2.1 Define the concept (individual, society, socialization, Nation, Nationality, citizen and citizenship).
- 2.2 State the relationship among the individuals in the society.
- 2.3 Discuss the methods of acquiring citizenship and state the causes of losing citizenship
- 2.4 Describe the rights of a citizen and state the need for developing good citizenship.

3. Appreciate the relationship between the state and government, law and organs of government.

- 3.1 Meaning the state, government and law
- 3.2 Discuss the elements of state.
- 3.3 Discuss the classification of the forms of government
- 3.4 Distinguish between cabinet form of Government and presidential form of government.
- 3.5 Describe the main organs of Government (legislature, Executive and judiciary)
- 3.6 Discuss the sources of law

4. Understand and the classification of constitution

- 4.1 Define the Constitution.
- 4.2 Explain the deferent form of Constitution
- 4.3 Explain state the salient feature of Bangladesh constitution.
- 4.4 Define the fundamental rights of Bangladesh constitution.
- 4.5 Meaning of human rights.

5. Understand the role of UNO in maintaining world peace

- 5.1 Explain the major functions of UNO.
- 5.2 State the composition and functions of General Assembly.
- 5.3 Describe the Composition and functions of Security Council.
- 6.4 Discuss the role of Bangladesh in the UNO.

6. Understand the role of Ethics values and good governance

- 6.1 Define the values, ethics and good governance.
- 6.2 Discuss the role of government to establish good governance

Part-2 (Economics)

1. Understand the fundamental concepts of economics.

- 1.1 Define the Microeconomics and Macroeconomics.
- 1.2 Discuss the definition of Economics as given by eminent economists.
- 1.3 Describe the importance of economics for Technical Student.
- 1.4 Define commodity, utility, value, wealth, consumption, income, savings, wages, value in use, value in exchange and salary.
- 1.5 Differentiate between value in use and value in exchange.
- 1.6 Explain wealth with its characteristics.

2. Understand the production process and the concept of the law of diminishing returns in the production process.

- 2.1 Discuss production mode and process
- 2.2 Explain the nature of different factors of production.
- 2.3 Discuss production function.
- 2.4 Discuss the law of diminishing returns.
- 2.5 State the application and limitations of the law of diminishing returns.
- 2.6 Describe the law of production (increasing constant and diminishing).

3. Understand the concept of demand, supply and utility.

- 3.1 Define the term, “demand and supply”.
- 3.2 Explain the law of demand and supply .
- 3.3 Draw the demand and supply curve.
- 3.4 Discuss Market equilibrium.
- 3.5 Define the utility, total and marginal utility
- 3.6 Illustrate the law of diminishing utility.
- 3.7 Explain the law of diminishing marginal utility

4. Understand national income.

- 4.1 Define nation income.
- 4.2 Explain how to measure national income.
- 4.3 Discuss GNP, GDP and NNP.
- 4.4 Discuss economic development and growth

5. Understand the current issues and the availability and use of natural resource in the economic development of Bangladesh

- 5.1 Define rural and urban economics.
- 5.2 Identify major problems of rural and urban economy.
- 5.3 Explain the migration of rural population to urban areas.
- 5.4 List of the Natural resource of Bangladesh and classify them according to sources of availability.
- 5.5 Explain the importance of the mine, forest and water resources and potential uses for sustainable development.

6. Role of a Diploma Engineer in the Development of Bangladesh Economy.

- 6.1 Explain the concept of the term, “Engineering team”
- 6.2 Identify the functions of Engineers, Diploma Engineers, craftsmen forming the engineering team.
- 6.3 Discuss the role of a Diploma Engineer in the overall economic development of Bangladesh.
- 6.4 Explain socio-economic status of a diploma Engineer.

Part-3 (Bangladesh: History& Culture)

সংক্ষিপ্ত বিবরণী

ইতিহাস

- ইতিহাসের সংজ্ঞা।
- বাংলাদেশের আবহাওয়া ও অধিবাসী।
- বাংলায় ইংরেজ শাসন ক্ষমতালাভ ও প্রতিষ্ঠা।
- ত্রিটিশ বিরোধী সশ্রম প্রতিরোধ আন্দোলন; সংস্কার আন্দোলন ও জাতীয়তাবাদেও বিকাশ এবং বাংলার নবজাগরণ; বঙ্গভঙ্গ ও বঙ্গভঙ্গ উত্তরকালে বাংলার রাজনৈতি ও দেশ বিভাগ।
- পাকিস্তান আমলে বাংলাদেশ, বঙ্গবন্ধুর নেতৃত্বে বাংলাদেশের মুক্তি সংগ্রাম ও স্বাধীনতালাভ।

সংস্কৃতি

সংস্কৃতি, সভ্যতার সংজ্ঞা, সংস্কৃতির প্রকরণ, ভাষা আন্দোলন উত্তর বাংলার সংস্কৃতি, স্বাধীনতা উত্তর বাংলাদেশের সংস্কৃতির বিবরণ, বাংলাদেশের সংস্কৃতিতে প্রত্নতার্থিক নির্দেশন ও ক্ষুদ্র ন্যাতার্থিক গোষ্ঠীসমূহ।

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BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207.

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

CIVIL TECHNOLOGY

TECHNOLOGY CODE: 664

4th SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

CIVIL TECHNOLOGY (664)

4th SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total	
						Theory		Practical			
						Cont. assess	Final exam	Cont. assess	Final exam		
1	66441	Structural Mechanics	2	3	3	40	60	25	25	150	
2	66442	Estimating & Costing-1	2	3	3	40	60	25	25	150	
3	66443	Civil Engineering Drawing-2 (CAD)	1	6	3	20	30	50	50	150	
4	66444	Surveying-2	2	3	3	40	60	25	25	150	
5	66445	Geotechnical Engineering	2	3	3	40	60	25	25	150	
6	69054	Environmental Studies	2	0	2	40	60	0	0	100	
7	65841	Business Organization & Communication	2	0	2	40	60	0	0	100	
Total			13	18	19	260	390	150	150	950	

66441

Structural Mechanics

T P C

2 3 3

AIMS:

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

SHORT DESCRIPTION

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

DETAIL DESCRIPTION

Theory:

1.0 Understand the important aspects of mechanical properties of materials.

- 1.1 Mention the necessity to know about the mechanical properties of materials.
- 1.2 Define the following terms:
 - a. Stress, tensile stress, compressive stress, shear stress.
 - b. Strain, tensile strain, compressive strain, shear strain,
 - c. Hooke's law, modulus of elasticity and modulus of rigidity.
- 1.3 Explain stress-strain diagram of mild steel and concrete.
- 1.4 Define the following terms:
 - a. Elasticity, proportional limit, yield point, ultimate stress, breaking stress, working stress and factor of safety.
 - b. Strength, stiffness, toughness, ductility, malleability, brittleness, creep, fatigue failure, resilience, modulus of resilience, thermal stress in simple bar and poisons ratio.
- 1.5 Compute stress, strain, modulus of elasticity and modulus of rigidity.
- 1.6 Solve problems involving resilience, thermal stress and poisons ratio.
- 1.7 Compute stress develop in composite bar under tension and compression.

2. Understand the concept of laws of forces.

- 2.1 Explain the laws of forces.
- 2.2 Define the following terms:

Force, co-planar forces, non-coplanar forces, concurrent forces, non-concurrent forces, co-linear forces, parallel forces, laws of equilibrium of forces.
- 2.3 Mention the parallelogram laws of forces.
- 2.4 State the composition of forces and resolution of force.
- 2.5 Define component of force, rectangular component and resultant of forces.
- 2.6 Compute the resultant force-
 - a. Triangle of forces
 - b. Polygon of forces
 - c. Converse laws of triangle and polygon laws of forces graphically.
- 2.7 Calculate the resultant of forces: co-planar forces, concurrent forces, parallel forces and co-linear forces
- 2.8 Explain Lami's theorem.
- 2.9 Solve problems on Lami's theorem.

3. Understand the aspects of moment of forces.

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

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

4. Understand the concept of frictional forces.

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

5. Understand the aspects of centroid and centre of gravity.

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

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

6. Understand the concept of moment of inertia.

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

7. Understand the aspects of torsion on solid and hollow circular shaft.

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

8. Understand shear force (SF) and bending moment (BM).

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

PRACTICAL:

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

REFERENCE BOOKS:

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

66442

Estimating & Costing – I

T P C
2 3 3

AIMS:

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

SHORT DESCRIPTION:

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

DETAIL DESCRIPTION:

Theory:

1. Understand the basic concept of estimating.

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

2. Estimate the volume of earth work for excavating a tank

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

3. Estimate the volume of earth work for road embankment.

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

4. Estimate the volume of earth work for canal digging.

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

5. Estimate the different quantities of item of works in steps, boundary wall and roads.

- 5.1 Identify different parts of a step and calculate the quantities of works.
- 5.2 List different items of works in a boundary wall.
- 5.3 List different items of works in a bituminous road.

- 5.4 List different items of works in a RCC road.
- 5.5 Prepare an estimate for construction of 100m long boundary wall.
- 5.6 Prepare an estimate for construction of 100m long bituminous road.
- 5.7 Prepare an estimate for construction of 100m long RCC road.

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

- 6.1 State centre line and separate wall method.
- 6.2 Mention the advantage and disadvantage of centre line and separate wall methods.
- 6.3 Explain the methods of deduction for opening or over lapping.
- 6.4 Define the terms sub-structure and super- structure.
- 6.5 Calculate the earth work in excavation of foundation trenches.
- 6.6 Calculate the brick work (1:6) in foundation up to plinth level.
- 6.7 Calculate the wood work in door and window frames.
- 6.8 Calculate the wood work in door and window shutters.

7. Understand the basic concept of rate analysis.

- 7.1 State meaning of rate analysis. .
- 7.2 Explain the purposes of rate analysis.
- 7.3 Explain the terms: contractors profit, overhead charges, contingency sundries and lump sum (LS)
- 7.4 Explain the unit rate of materials & labour.
- 7.5 Mention the advantage of rate analysis to prepare cost estimate.
- 7.6 Determine the analysis of rates for different items of building works.
 - a) Brick flat soling & herring bone bond (10 sqm).
 - b) 125 mm thick & 250 mm thick brick work (10cum).
 - c) Cement concrete (1:3:6) work for 10cum.
 - d) R.C.C. works (1:2:4) for 10cum.
 - e) Plastering work with cement mortar (1:6) for 10 sqm.

PRACTICAL

- 1. Determine the rate of different categories of labour considering the work site including lead and lift.
- 2. Calculate the quantity of cement, sand and brick required for 10 cum masonry work using (1:6) mortar.
- 3. Calculate the quantity of cement, sand and brick required for 10 sqm brick masonry work (125mm thick wall) with 1:4 mortar.
- 4. Calculate the quantity of cement, sand and brick khoa required for 10 cum reinforced cement concrete (1:2:4) work.
- 5. Prepare an estimate for construction of underground water reservoir.
- 6. Prepare an estimate for making wooden chair/ table/almirah.
- 7. Calculate the quantity of following items of work of a double storied building with verandah.
 - 7.1 One layer brick flat soling in foundation and floor.
 - 7.2 Cement concrete work (1:3:6) in foundation and floor.
 - 7.3 Earth work in filling the sides of foundation trenches and plinth.
 - 7.4 Brick work (1:6) in super structure.
 - 7.5 125 mm thick Brick work (1:4) in partition wall.
 - 7.6 RCC work (1:2:4) in lintel, beams, roof slab, stair, sunshade and drop wall.
 - 7.7 Mild steel bar reinforcement fabrication in different RCC works when percentage given.
 - 7.8 Grill work for windows.
 - 7.9 Cement plaster to both sides of brick wall.
 - 7.10 Cement plaster to all RCC surface.
 - 7.11 Cement plaster to plinth wall and skirting with neat cement finishing (NCF).
 - 7.12 Patent stone flooring (PSF)
 - 7.13 Lime terracing over RCC roof slab.
 - 7.14 White washing/distempering.
 - 7.15 Color washing/ snowcem washing/weather coat.

REFERENCE BOOKS:

- 1. Estimating and costing - B N Datta
- 2. Estimating and costing - Gurucharan Singh

66443

Civil Engineering Drawing -2(CAD)

**T P C
1 6 3**

AIMS

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

SHORT DESCRIPTION

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

DETAIL DESCRIPTION

Theory:

1. Understand the functions and uses of different CAD commands.

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

2. Understand the functions and uses of different CAD commands.

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

3. Understand the features of multi-storied building.

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

4. Understand the preparation of plan, section, elevation and other components of multi-storied framed structure building using CAD.

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

5. Understand the preparation of elevation and cross section of RCC cantilever retaining wall using CAD.

- 5.1 Describe the process of making the detail elevation of RCC retaining wall showing curtailment of reinforcement.
- 5.2 Describe the process of drawing cross section of RCC retaining wall.
- 5.3 Describe the process of drawing the counter fort details showing reinforcement including retaining wall.

6. Understand the preparation of detailed drawing of foundation using CAD.

- 6.1 Describe the process of drawing spread footing foundation.
- 6.2 Describe the process of drawing raft foundation showing the reinforcement detail.
- 6.3 Describe the process of drawing plan and sectional elevation of pile showing the reinforcement detail.
- 6.4 Describe the process of drawing plan and sectional elevation of pile cap showing the reinforcement detail.
- 6.5 Describe the process of drawing plan and cross sectional elevation of well foundation showing the reinforcement.

7. Understand the preparation of working drawing of continuous rectangular beam and T-beam using CAD.

- 7.1 Describe the process of making detail drawing of RCC fully continuous rectangular beam showing reinforcement.
- 7.2 Describe the process of making detail drawing of RCC fully continuous T-beam showing reinforcement.
- 7.3 Describe the position of reinforcement in the junction of column with beam.

8. Understand the preparation of plan and section of one -way and two-way slab using CAD.

- 8.1 Describe the process of making detailed drawing of semi-continuous one- way slab showing reinforcement.
- 8.2 Describe the process of making detailed drawing of fully continuous one- way slab showing reinforcement.
- 8.3 Describe the process of making detailed drawing of semi-continuous two- way slab showing reinforcement.
- 8.4 Describe the process of making detailed drawing of fully continuous two-way slab showing reinforcement.

9. Understand the preparation of plan and sectional elevation of a half turn staircase, ramp and lift core using CAD.

- 9.1 Describe the process of drawing the plan of a half turn staircase.
- 9.2 Describe the process of drawing the sectional elevation of a half turn staircase.
- 9.3 Describe the process of making detailed drawing of a half turn staircase showing reinforcement.
- 9.4 Describe the process of drawing ramp with showing reinforcement.
- 9.5 Describe the process of making plan and section of lift core showing the reinforcement.

10. Understand the preparation of plan and sectional elevation of an underground water reservoir and septic tank using CAD.

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

PRACTICAL:

1. Prepare geometrical drawing using CAD.

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

2. Draw and save drawing using CAD.

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

3. Edit the existing drawing using CAD.

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

4. Dimension a drawing using CAD.

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

5. Layers and hatches the drawing using CAD.

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

6. Use text and plot the drawing.

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

7. Prepare plan, section and elevation of multi-storied building using CAD.

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

- 8. Prepare the working drawing of RCC column with footing, raft and pile foundation using CAD.**
 - 8.1 Draw the plan of square and rectangular column with footing showing the reinforcement.
 - 8.2 Draw the sectional elevation of RCC column showing the reinforcement.
 - 8.3 Draw the detailed working drawing of circular RCC column with footing showing reinforcement.
 - 8.4 Draw the detailed drawing of raft foundation.
 - 8.5 Draw the detail drawing of pile with pile cap.
- 9. Prepare the working drawing of RCC lintel with sunshade and RB lintel using CAD.**
 - 9.1 Draw the detailed drawing of RCC lintel showing the reinforcement.
 - 9.2 Draw the detailed drawing of RCC lintel with sunshade showing reinforcement.
 - 9.3 Draw the detailed drawing of RB lintel.
- 10. Prepare elevation and cross section of cantilever RCC retaining wall using CAD.**
 - 10.1 Draw the detailed elevation of RCC retaining wall showing curtailment of reinforcement.
 - 10.2 Draw the detailed cross section of cantilever retaining wall.
 - 10.3 Draw the counterfort retaining wall showing details reinforcement.
- 11. Prepare the working drawing of continuous rectangular beam and T-beam using CAD.**
 - 11.1 Draw the detailed drawing of RCC fully continuous rectangular beam showing reinforcement.
 - 11.2 Draw the detailed drawing of RCC fully continuous T-beam showing reinforcement.
 - 11.3 Draw the junction of column and beam showing the reinforcement.
- 12. Prepare plan and section of one-way and two-way slab using CAD.**
 - 12.1 Draw the detailed drawing of semi-continuous one-way slab showing reinforcement.
 - 12.2 Draw the detailed drawing of fully continuous one-way slab showing reinforcement.
 - 12.3 Draw the detailed drawing of semi-continuous two-way slab showing reinforcement.
 - 12.4 Draw the detailed drawing of fully continuous two-way slab showing reinforcement.
- 13. Prepare the plan and sectional elevation of a half turn staircase using CAD.**
 - 13.1 Draw the plan of a half turn staircase.
 - 13.2 Draw the sectional elevation of a half turn staircase.
 - 13.3 Draw the detailed drawing of a half turn staircase showing reinforcement.
 - 13.4 Draw the detailed drawing of a ramp showing reinforcement.
 - 13.5 Draw the detail drawing of a lift core showing reinforcement.
- 14. Prepare detail drawing of underground water reservoir and septic tank using CAD.**
 - 14.1 Draw the plan and sectional elevation of an underground water reservoir showing the reinforcement.
 - 14.2 Draw the plan and sectional elevation of a septic tank.
 - 14.3 Draw the plan and section of soak pit and inspection pit.
 - 14.4 Draw the detailed drawing of a water closet including gully trap.

REFERENCE BOOKS

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

66444

Surveying – II

T P C
2 3 3

AIMS:

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

- To use level and theodolite.
- To conduct leveling work.
- To recognize errors in leveling.
- To conduct traversing with theodolite.
- To determine horizontal and vertical distances of inaccessible points.

SHORT DESCRIPTION

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

DETAIL DESCRIPTION

Theory:

1 Understand the concept of leveling.

- 1.1 Define Level and Leveling
- 1.2 Describe the purpose of leveling.
- 1.3 Explain the following terms in leveling:
 - a) Level surface b) Level line c) Horizontal surface d) Horizontal line
 - e) Vertical plane f) Vertical line g) Datum surface h) Datum line
 - i) Reduced level j) Formation level
- 1.4 Define bench mark.
- 1.5 Mention the classification of bench marks.
- 1.6 Describe different types of bench mark.

2 Understand the features of leveling instruments and their application.

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

3 Understand the adjustment of level.

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

4 Understand booking of staff reading and reduction of level.

- 4.1 Define back sight, foresight and intermediate sight reading, change point, negative staff reading and station
- 4.2 State the necessity of different types of level book.
- 4.3 Describe reduction of leveling.
- 4.4 Mention the procedure of booking of staff reading into level book.
- 4.5 Compare different methods of reduction of leveling.
- 4.6 Solve problems on reduction of leveling.
- 4.7 Solve problems on calculation of missing data of old level book.

5 Understand various types of leveling.

- 5.1 List different types of leveling.
- 5.2 State the purposes of fly leveling, profile leveling, cross sectioning, check leveling and reciprocal leveling
- 5.3 Describe the procedure of fly leveling; profile leveling, cross sectioning, check leveling and reciprocal leveling.
- 5.4 Solve different problems on fly leveling; profile leveling, cross sectioning, check leveling and reciprocal leveling.
- 5.5 Describe the procedure of plotting long and cross-section of leveling works.
- 5.6 Prepare longitudinal profile and cross profile from given data.

6 Understand the obstacles and errors in leveling.

- 6.1 Identify obstacles in leveling.
- 6.2 Mention the procedure of leveling in the following cases:
 - a) Ascending and descending a hill.
 - b) Staff too near the level.
 - c) Staff too low or too high.
 - d) Staff station above the line of collimation.
 - e) Wall on the alignment.
- 6.3 List the instrumental and personal errors in leveling.
- 6.4 Explain the effects of earth's curvature and refraction of light on leveling.
- 6.5 Interpret the formula for earth curvature and refraction of light.
- 6.6 Solve problems on errors due to curvature and refraction.
- 6.7 Deduce the formula for distance to the visible horizon and dip of the horizon.
- 6.7 Solve problems on visible horizon and dip of the horizon.
- 6.9 Specify the magnitude and permissible limits of closing error in leveling.

7 Understand the aspects of contouring and mapping

- 7.1 Define contour, contouring, horizontal equivalent and vertical interval.
- 7.2 Mention the characteristics of contour.
- 7.3 Describe the uses of contour.
- 7.4 Mention the different methods of contouring.
- 7.5 State the procedure of different methods of contouring.
- 7.6 Explain interpolation of contour by estimation method only.
- 7.7 Mention the procedure of drawing contour map of hill, reservoir, valley etc.
- 7.8 Mention various uses of contour map.
- 7.9 State the procedure of locating the proposed route for a road, canal and drainage work.

8 Understand the fundamentals of theodolite.

- 8.1 Identify the parts of theodolite.
- 8.2 Mention the functions of different parts of theodolite.
- 8.3 State the meaning of diaphragm, lens, centering, transiting and swing, display board.
- 8.4 Describe different types of adjustment of theodolite
- 8.5 State different steps of temporary adjustment of theodolite.
- 8.6 Describe the fundamental lines of theodolite.
- 8.7 Mention the relations among the fundamental lines.
- 8.8 Describe the permanent adjustments of theodolite.

9 Understand the principles of measuring angle and bearing with theodolite.

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

10 Understand the application of trigonometrical leveling.

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

11 Understand the principles of traverse survey.

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

12 Understand the concept of solving problem in traversing.

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

13 Understand the concept of topographic surveying.

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

PRACTICAL:

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

REFERENCE BOOKS:

- 1 Surveying & Leveling – T P Kanetker
- 2 Surveying – Norman Thomas
- 3 Surveying Volume I and II – Dr. B.C. Punmia
- 4 Surveying – S.K. Hossain

66445

Geotechnical Engineering

T P C
2 3 3

AIMS:

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

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

SHORT DESCRIPTION:

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

DETAIL DESCRIPTION:

Theory:

1. Understand the basic concept of geotechnical engineering.

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

2. Understand preliminary soil tests.

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

3. Understand the particle size of soil.

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

4. Understand the plasticity characteristics of soil.

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

5. Understand the hydraulic properties of soil.

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

6. Understand the consolidation characteristics of soil.

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

7. Understand the purpose of subsurface investigation.

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

8. Understand the aspect of lateral earth pressure.

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

9. Understand the bearing capacity of soil.

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

PRACTICAL:

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

REFERENCE BOOKS:

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

69054

Environmental Studies

T P C

2 0 2

AIMS

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

SHORT DESCRIPTION

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

DETAIL DESCRIPTION

1. Understand the multidisciplinary nature of environmental studies.

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

2. Understand the natural resources.

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

3. Understand the biogeochemical cycling.

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

4. Understand the ecology and ecosystem.

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

5. Understand the air as a component of environment.

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

6. Understand the water as a component of environment.

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

7. Understand the soil as a component of environment.

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

8. Understand the concept of solid waste management.

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

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

9. Understand the development and environment.

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

10. Understand the global environmental challenges.

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

11. Understand the legislative protection of environment.

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

REFERENCES:

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

65841 Business Organization & Communication

T P C

2 0 2

AIMS:

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

SHORT DESCRIPTION:

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

DETAIL DESCRIPTION:

Theory:

1 Concept of Business organization.

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

2 Formation of Business organization.

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

3 Basic idea of Banking system and negotiable instrument.

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

4 Home & foreign trade

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

5 Basic concepts of communication

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

6 Communication model and feedback.

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

7 Types and Methods of communication.

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

8 Essentials of communication.

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

9 Report writing.

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

10 Office management.

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

- 10.5 Discuss the methods of indexing.
- 10.6 Distinguish between filing and indexing.

11 Official and semi-official letters.

- 11.1 State the types of correspondence.
- 11.2 State the different parts of a commercial letter.
- 11.3 Define official letter and semi-official letter.
- 11.4 Prepare & present the following letters: Interview letter, appointment letter, joining letter and application for recruitment. Complain letters, tender notice.

REFERENCE BOOK:

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



BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207

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

CIVIL TECHNOLOGY
TECHNOLOGY CODE: **664**

5th SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

CIVIL TECHNOLOGY (664)

5th SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total	
						Theory		Practical			
						Cont. assess	Final exam	Cont. assess	Final exam		
1	66451	Construction Process-II	2	3	3	40	60	25	25	150	
2	66452	Surveying-III	2	3	3	40	60	25	25	150	
3	66453	Water Supply Engineering	2	3	3	40	60	25	25	150	
4	66454	Theory of Structure	2	3	3	40	60	25	25	150	
5	66455	Estimating & Costing-II	2	3	3	40	60	25	25	150	
6	66456	Hydraulics	2	3	3	40	60	25	25	150	
7	65851	Accounting Theory & Practice	2	3	3	40	60	50	0	150	
Total			14	21	21	280	420	200	150	1050	

66451

Construction Process –II

T P C
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AIMS

After completion of the course the students will be able to:

- Understand the construction process of arch and lintel.
- Understand the construction process of different types of floor.
- Understand the construction process of stairs.
- Understand the construction process of different types of roof.
- Understand the different finishing works in building.
- Understand the construction process of doors and windows.
- Understand the different operation and maintenance construction equipment.
- Understand the construction of bridge, culvert, canals etc.

SHORT DESCRIPTION

Arches; Lintels; Ground floors; Upper floors; Damp proofing; Termite treatment; Stairs; Roof; Pitched roof; Plastering and pointing; Doors; Windows; Carpentry and joinery; Scaffolding; Form works, Pointing & Varnishing, construction equipment, Building Services, Insulation, bridge/culverts and canals etc.

DETAIL DESCRIPTION

1. Understand the different type of arches and lintels.

- 1.1 State the meaning of arch and lintel.
- 1.2 Mention the functions of arch and lintels.
- 1.3 List the common terms used in arches and lintels.
- 1.4 Mention the different type of arches according to their shape, center and material.
- 1.5 Describe the correct procedures of construction of arches and lintels.

2. Understand the floor.

- 2.1 Mention the components of a floor.
- 2.2 Mention the essential requirements of a floor.
- 2.3 Name the suitable materials used for the construction of floor.
- 2.4 Describe the construction procedure of the following type of floors:

Brick floor, Brick concrete floor, Terrazzo floor, Mosaic floor, Tiled floor, Marble floor, Timber floor, Reinforced Glass floor, Cork floor, Glass floor, Plastic floor, Ribbed floor, Solid floor, Hollow floor, Composite floor, Rubber paint floor, Epoxy paint floor

3. Understand the dampness of building.

- 3.1 Mention the causes and ill effects of dampness in building.
- 3.2 Describe the methods of damp proofing of building.
- 3.3 Define efflorescence.
- 3.4 Describe remedial measures against efflorescence.
- 3.5 Mention the requirements of an ideal damp proofing material.
- 3.6 Describe the damp proof course (DPC) treatment for wall with sketches.
- 3.7 Mention the function of PVC felt used in basement.
- 3.8 State the function of rubber stopper to prevent the leakage of water.
- 3.9 State the function of water proofing agent.

4. Understand the damages due to termite in building.

- 4.1 Identify different type of termites.
- 4.2 Explain the damages due to termite in building on economic point of view.
- 4.3 Name the chemicals used for anti-termite treatment.
- 4.4 Describe the methods of pre-construction anti-termite treatment.
- 4.5 Describe the methods of post-construction anti-termite treatment.

5. Understand the stairs.

- 5.1 Differentiate between stairs and staircase.
- 5.2 Mention the functions and location of stairs.
- 5.3 Define the technical terms used in stairs.
- 5.4 Mention the requirements of a good stair.
- 5.5 Express the relationship between tread and riser.
- 5.6 List the suitable materials for construction of stairs.
- 5.7 Mention the classification of stairs.
- 5.8 Make a Plan of a staircase for a building from a given stair hall and room height.

6. Understand the roofs.

- 6.1 List the different kind of roofs.
- 6.2 Mention the functions of a roof.
- 6.3 Mention the essential requirements of a good roof.
- 6.4 Define the technical terms used in roofs.
- 6.5 Compare the advantages and limitations of flat roof over pitched roof.
- 6.6 Describe the construction procedure of a lean-to-roof.
- 6.7 Distinguish between king post truss and queen post truss.
- 6.8 Mention the advantages of steel trusses over wooden trusses.
- 6.9 Materials required for buildup section and rolled section.

7. Understand the plastering and pointing finishing works.

- 7.1 Describe the various types of plaster on the basis of their suitability and uses.
- 7.2 Name the different kinds of pointing with sketches.
- 7.3 State the purpose of plastering and pointing.
- 7.4 Mention the common tools used for plastering and pointing works with their functions.
- 7.5 Describe the process of applying plaster on new surface and old surface.
- 7.6 Mention the common defects in plastering and pointing.
- 7.7 State how the defects of plastering and pointing can be rectified.
- 7.8 Distinguish between plastering and pointing.
- 7.9 State the meaning of acoustics tiles, aluminum cladding panel (ACP), rustic tiles.

8. Understand the doors.

- 8.1 Identify the technical terms used in doors.
- 8.2 Mention the factors to be considered in determining the size, shape, location and number of doors in a room.
- 8.3 Describe the various types of doors on the basis of their suitability and uses.
- 8.4 Mention the advantages and limitations of the followings:
 - Panel door, Flush door, Glazed door, Fire proof door, Auto censor door, Composite door,
 - Louvered door, Mild steel sheet door, Sliding door, Swing door, Collapsible door, Rolling shutter door, Revolving door, Plastic door.
- 8.5 Describe the methods of fixing door frames.

9. Understand the windows.

9.1 Mention the factors to be considered to determine the size, shape, location and number of windows in a room.

9.2 Describe the various types of windows on the basis of their suitability and uses.

9.3 Mention the advantages and limitations of the followings:

Fixed window, Pivoted window, Steel casement window, Sliding window, uPVC channel window, Louvered window, Bay window, Glazed window, Corner window, Dormer window, Gable window, Lantern window

9.4 State the functions of skylight, sunlight, fanlight and ventilator.

9.5 Describe the methods of fixing windows.

9.6 Compare among the wooden, steel and aluminum glazed window.

10. Understand the importance of scaffolding.

10.1 State the meaning of scaffolding.

10.2 Explain the necessity and uses of scaffolding.

10.3 Name the different types of steel scaffolding.

10.4 Name the different components of scaffolding.

10.5 Advantages of ringlock scaffolding as compared with general steel scaffolding.

10.6 Advantages of cuplock scaffolding as compared with general steel scaffolding.

10.7 Installation process of ringlock scaffolding.

10.8 Installation process of cuplock scaffolding.

10.9 Compare the advantages and limitations of timber scaffolding over steel scaffolding.

10.10 Differentiate between shoring and scaffolding.

10.11 Describe the safety requirements for scaffolding works.

11. Understand the significance of form works.

11.1 State, form works, centering and shuttering.

11.2 Explain the necessity and uses of form works.

11.3 Name the different components of form works.

11.4 Mention the essential requirements of a good form work.

11.5 Describe the process of making form works of the followings:

- | | | |
|-----------|------------------|---------------|
| a. Column | b. Beam and slab | c. Stair |
| d. Wall | e. Lift core | g. Share wall |

11.6 Describe the specifications for cleaning & treatment of forms and scrapping of form works.

11.7 Describe the removal technique of form works.

11.8 Describe the methods for fair face concreting.

12. Understand the process of painting & Varnishing.

12.1 State the purpose of painting & varnishing.

12.2 Name the ingredients of paint & varnishes.

12.3 Mention the specific function of each ingredient of paint & varnishes.

12.4 Describe the characteristics of good paints & varnishes.

12.5 State the various defects in painting & varnishing.

12.6 Describe the factors that should be considered during the supervision of quality painting & varnishing work.

12.7 Differentiate between the properties and ingredients of the following:

- | | |
|---------------------------------|------------------------------------------------------|
| a. White wash and color wash. | b. Distemper and snowcem wash. |
| c. Weather coat and white wash. | d. oil based paint and water based paint |
| e. Weather coat and distemper | f. plastic emulsion paint and synthetic enamel paint |

- 12.8 Describe the procedure of application of the following on new and old surfaces:
- a. White wash
 - b. Color wash
 - c. Distemper
 - d. Weather coat
 - e. Epoxy paint
 - f. Rubber paint
 - g. Plastic emulsion paint
 - h. Synthetic enamel paint
 - i. Snowcem (cement based paint)

13. Understand the necessity of equipment in construction works.

- 13.1 List the equipment required for construction works.
- 13.2 Mention the specific use of each equipment required for construction works.
- 13.3 Describe the operation and maintenance of different pumps used in construction works.
- 13.4 Describe the operation and maintenance of earth excavating machine, bulldozer machine, roller machine, brick cutter machine, crushing (brick/stone) machine, concrete pump machine, concrete hoisting equipment.
- 13.5 Describe the operation and maintenance of different conveyor used in construction works.
- 13.6 State the function of vibrator machine.
- 13.7 Describe the operation and maintenance of plate compactor, hammer/frog hammer, Compactor.

14. Understand the necessity of different building services.

- 14.1 State the necessity of different building services.
- 14.2 Classify different kinds of building services.
- 14.3 Describe the procedure of gas line installation in building.
- 14.4 Describe the layout of electrical wiring with various fittings in building.
- 14.5 Describe the process of installation of mechanical ventilation and air-conditioning system in building.
- 14.6 Describe the method of installation of elevator or lift and escalator system in a building.
- 14.7 Describe the fire protection and detection system in a building.
- 14.8 Define smoke detector, heat detector and fire alarm.
- 14.9 Describe the procedure of smoke detector, heat detector and fire alarm in firefighting system.

15. Understand building codes and building by laws.

- 15.1 State different codes followed in construction methodology.
- 15.2 State the main features of Bangladesh National Building Code (BNBC), 2015 and Building Construction Rules-2015 by Public Works Department (PWD) Bangladesh with latest update in construction industry.
- 15.3 Define building bye laws.
- 15.4 Explain the municipal regulation in building planning.
- 15.5 Describe the importance of building bye laws.
- 15.6 Describe the economical planning of a residential building.
- 15.7 Define orientation of a building
- 15.8 Describe the effects of orientation of building on the basis of local climates.

16. Understand the different insulation in building.

- 16.1 Define thermal and sound insulation.
- 16.2 State the necessity of thermal and sound insulation in building.
- 16.3 List various types of materials used for thermal and sound insulation.
- 16.4 Describe the general methods of thermal and sound insulation in building.
- 16.5 Describe the process of thermal insulation of the following with neat sketches:
 - a. Floor.
 - b. Roof.
 - c. Exposed wall.
 - d. Exposed door and window.

17. Understand the construction process of dam, embankment and irrigation and drainage canal.

- 17.1 Define levee, dyke, spur, groyne, dam and embankment.
- 17.2 State the necessity of dam and embankment.
- 17.3 Describe the procedure of selection of alignment.
- 17.4 Describe the factors to be considered in designing dam and embankment.
- 17.5 Describe the process of maintenance of dam and embankment.
- 17.6 Describe the procedural steps of construction of irrigation and drainage canal.
- 17.7 Describe the process of maintenance of irrigation and drainage canal.

18. Understand the construction process of bridge and culvert.

- 18.1 State different types of bridge and culvert.
- 18.2 Distinguish between bridge and culvert.
- 18.3 Mention different components of bridge and culvert.
- 18.4 Describe the process of setting out plan of bridge and culvert.
- 18.5 Describe the procedural steps of construction of bridge and culvert.
- 18.6 Explain the necessity of inspection of bridge and culvert for maintenance.
- 18.7 Describe the factors to be considered for inspection of bridge and culvert.

PRACTICAL:

1. Construct a semi-circle/segmental brick arch.

- 1.1 Select the required tools and raw materials.
- 1.2 Make form works with suitable materials.
- 1.3 Prepare cement mortar as required.
- 1.4 Place the bricks on proper position with cement mortar.
- 1.5 Do the curing of the brick work properly.
- 1.6 Remove the form works.

2. Construct any one of the following floors with suitable materials.

Brick floor; Brick concrete floor; Terrazzo floor; Mosaic floor; Tiled floor; Timber floor; RCC solid floor; RCC ribbed floor

- 2.1 Select the required tools and raw materials.
- 2.2 Prepare the floor according to standard specification.
- 2.3 Clean the work site.
- 2.4 Deck floor using steel deck sheet with RCC toping.

3. Perform a case study of dampness in building.

- 3.1 Identify a damped building.
- 3.2 Investigate the reasons of dampness for major affected areas and causes.
- 3.3 Select the method of damp proofing.
- 3.4 Estimate the materials to be needed for damp proofing.
- 3.5 Prepare a report on the specified case of dampness in building.

4. Construct the form work of a stair.

- 4.1 Collect the required tools and raw materials.
- 4.2 Draw a neat sketch of stair (at least ten nos. steps) with waist slab shutter.
- 4.3 Make the bottom supports and erect inclined way.
- 4.4 Fix the steps and side of steps.
- 4.5 Check the accuracy of the works in all respects.

5. Construct a wooden lean-to-roof, queen post roof truss, king post roof truss.

- 5.1 Collect the required tools and raw materials.
- 5.2 Draw the neat sketch with dimensions.
- 5.3 Make the joints and assemble the members.
- 5.4 Erect the proper position.
- 5.5 Check the accuracy of the work.

6. Perform cement plastering to brick walls.

- 6.1 Collect the required tools and raw materials.
- 6.2 Clean the loose materials from the surface.
- 6.3 Raking out all the joints up to required depth.
- 6.4 Wash the surface with water.
- 6.5 Prepare cement mortar as required proportion.
- 6.6 Provide dots and check the thickness of cement plaster.
- 6.7 Provide the screed properly.
- 6.8 Apply mortar (top to bottom and left to right).
- 6.9 Plain / level the surface as possible.

7. Perform pointing works to a boundary wall.

- 7.1 Collect the required tools and raw materials.
- 7.2 Clean the loose materials from the surface.
- 7.3 Raking out all the joints up to required depth.
- 7.4 Wash the surface with water.
- 7.5 Prepare cement mortar as required proportion.
- 7.6 Apply mortar to the joints and press (top to bottom and left to right).
- 7.7 Check the joints accordingly.
- 7.8 Do curing accordingly.

8. Construct a single layer and double layers scaffolding.

- 8.1 Collect the required tools and raw materials.
- 8.2 Erect the vertical members.
- 8.3 Place the horizontal members and tied with jute rope.
- 8.4 Place the boards for platform.
- 8.5 Provide the bracings accordingly.
- 8.6 Check the properness of the scaffolding work.
- 8.7 Disassemble all the members and store the materials used.

9. Prepare form works for columns/ beams, lift cores /share walls.

- 9.1 Collect the required tools and raw materials.
- 9.2 Make the boards according to required size.
- 9.3 Erect the boards and attached accordingly so that they can easily remove.
- 9.4 Check the dimensions of the column/beam.
- 9.5 Disassemble the form works and store the materials used.

**10. Perform white washing/ color washing/ distempering/ snowcem washing/ weather coating/
plastic emulsion painting on new/old surface.**

- 10.1 Collect the required tools and raw materials.
- 10.2 Prepare the surface as necessary.
- 10.3 Prepare white wash as required.
- 10.4 Apply first coat of white wash and allow to drying.
- 10.5 Apply second coat of white wash and allow to drying.
- 10.6 Apply the final coat of white wash.

11. Perform varnishing on new and old wooden surface.

11.1 Collect required tools and raw materials.

11.2 Prepare the surface as necessary.

11.3 Prepare varnish as required.

11.4 Apply first coat and allow to drying.

11.5 Apply second coat and allow to drying.

11.6 Apply the final coat of varnish.

12. (a) Draw plan and sectional elevation of on irrigative and drainage canal.

(b) Prepare a typical model of a drainage canal with suitable materials.

13. (a) Draw plan and sectional elevation of a RCC bridge or culvert.

(b) Prepare a typical model of a RCC bridge with or culvert suitable materials.

14. Make a site visit/field trip.

15. Field visit for steel scaffolding for construction site.

REFERENCE BOOKS

- | | | |
|--------------------------------------------|---|-------------------------|
| 1. Building Construction | - | B C Punmia |
| 2. A Text Book of Construction | - | S P Aurora & S P Bindra |
| 3. Building Construction | - | G J Kulkarni |
| 4. Building Construction | - | S C Rangwala |
| 5. Construction and Foundation Engineering | - | Dr. J Jha, S K Sinha |
| 6. Building Construction | | |

66452

Surveying – III

T P C

2 3 3

AIMS

- To be able to set out different types of curve.
- To be able to conduct sounding.
- To be able to learn using total station,
- To be able to perform city survey.

SHORT DESCRIPTION

Curve ranging; Setting out Plan/alignment; Hydrographic survey; Total station; City survey.

DETAIL DESCRIPTION

Theory:

- 1.1 Understand the concept of curve and curve ranging.**
 - 1.2 Define curve and curve ranging.
 - 1.3 Classify different types of curve.
 - 1.4 Describe circular curve with nomenclature.
 - 1.5 Express the deduction of formula for finding radius of a circular curve.
 - 1.6 Express the deduction of formula for calculating different elements of simple curve.
 - 1.7 Classify different methods of curve ranging.
 - 1.8 Describe the procedure of finding out deflection angle.
 - 1.9 Explain the importance of peg interval.
 - 1.10 Solve problem on different elements of simple curve.
- 2. Understand the procedure of setting out curves by linear methods.**
 - 2.1 Classify setting out curve by linear method.
 - 2.2 Express the deduction of formula for setting out curve by ordinates from long chord.
 - 2.3 Describe the procedure of setting out curve by ordinates from long chord.
 - 2.4 Express the deduction of formula for setting out curve by offsets from tangent (radial method).
 - 2.5 Express the deduction of formula for setting out curve by offsets from tangent (perpendicular method).
 - 2.6 Solve problems on setting out of circular curves.
- 3. Understand the procedure of setting out curves by angular methods.**
 - 3.1 Describe the angular methods of curve ranging.
 - 3.2 Express the deduction of formula for setting out curve by one theodolite method
 - 3.3 Describe the procedure of setting out curve by one theodolite method.
 - 3.4 Describe the procedure of setting out curve by two-theodolite method.
 - 3.5 Solve problems on setting out curve by angular method.
- 4. Understand the concept of transition curve.**
 - 4.1 Describe transition curve.
 - 4.2 List the elements of transition curve.
 - 4.3 Mention the conditions of transition curve.

- 4.4 Classify different types of transition curve.
- 4.5 Express the deduction of formula for calculating super elevation.
- 4.6 Express the deduction of formula for calculating the length of transition curve as used in highways and railways.
- 4.7 Describe the necessity of shifting curve.
- 4.8 Describe the procedure of setting out transition curve by tangential angle method.
- 4.9 Solve problems on transition curves.

5. Understand the concept of vertical curve.

- 5.1 Describe vertical curve.
- 5.2 Classify different types of vertical curve with their purposes.
- 5.3 Explain the properties of parabola.
- 5.4 Describe the calculating process of setting out data for vertical curve.
- 5.5 Describe the procedure of finding out the grade of an undulated proposed road.
- 5.6 Describe the procedure of setting out vertical curves.
- 5.7 Solve problem on vertical curve.

6. Understand the concept of setting out plan of a building and alignment of a road.

- 6.1 Explain the significance of setting out a plan of a building and alignment of a road.
- 6.2 List the instrument and accessories required for setting out works for building and road alignment.
- 6.3 Describe the procedure of providing reduce levels on different parts of a building and road.

7. Understand the concept of route survey.

- 7.1 State the meaning of route survey.
- 7.2 Explain the series of work of route survey of a project.
- 7.3 Describe the reconnaissance survey of a project.
- 7.4 Describe the preliminary survey of a project.
- 7.5 List the instrument required for preliminary survey.
- 7.6 Name the different parties for preliminary survey and describe their works.
- 7.7 Describe the location survey of a project.
- 7.8 Describe the construction survey of a project.

8. Understand the procedure of sounding.

- 8.1 State the meaning of sounding.
- 8.2 Describe the duties of members of a sounding party.
- 8.3 Distinguish between shoreline and range line.
- 8.4 Describe various types sounding equipment.
- 8.5 Describe the procedure of measuring sounding.
- 8.6 Mention the methods of locating sounding.
- 8.7 Explain the reduction of sounding.
- 8.8 Solve problems on reduction of sounding.
- 8.9 Describe the process of plotting of sounding.
- 8.10 Describe the procedure of solving three points problem.

9. Understand the principles of operation and uses of total station.

- 9.1 Describe the components of total station.
- 9.2 Mention the uses of total station.

- 9.3 Describe the procedural steps of setting total station.
- 9.4 Name the fundamental lines of total station.
- 9.5 Mention the relation among the fundamental lines.
- 9.6 List different types of adjustment.
- 9.7 Describe the procedure of taking readings with total station.

10. Understand the principles of making traverse with total station.

- 10.1 List the fieldworks involved in survey with total station.
- 10.2 Describe the procedure of measuring horizontal distance and vertical height with total station.
- 10.3 Describe the operational steps of traverse survey with total station.
- 10.4 Compute the Gale's traverse with the help of total station.
- 10.5 Describe the plotting of map of a traverse survey with total station.

11.Understand the procedure of city survey.

- 11.1 Explain the purpose of city survey.
- 11.2 List the maps required for city survey.
- 11.3 Describe the methods of establishing horizontal and vertical control.
- 11.4 List the instrument required for city survey.
- 11.5 Describe the method of preparing topographic map of a city.
- 11.6 Explain the objects of the property survey of a city.
- 11.7 Describe the method of preparing property map of a city.
- 11.8 Describe the method of preparing wall map of a city.
- 11.9 Describe the method of preparing underground map of a city.

PRACTICAL:

1. Set out circular curve by offset from long chord method.
2. Set out circular curve by offset from tangent (radial method).
3. Set out circular curve by offset from tangent (perpendicular method).
4. Set out circular curve by one theodolite method (Rankin method).
5. Set out circular curve by two theodolite method.
6. Perform layout plan of a building using theodolite.
7. Perform layout alignment of a highway.
8. Perform river or canal cross section by sounding method.
9. Demonstrate the components and use of Total Station.
10. Determine the horizontal and vertical distances with total station.
11. Conduct traversing with a total station and plot map including computation of area.
12. Field visit

REFERENCE BOOKS

- 1 Surveying and leveling - T P Kanetkar
- 2 Surveying - Norman Thomas

66453

Water Supply Engineering

T P C
2 3 3

AIMS

- To enable to select suitable methods for collection and distribution of water from given source to given community.
- To enable to identify impurities of water of given sources and selected suitable method/methods of purification up to potable standard.
- To assist in comparing various types of water pipes and pipe fittings.
- To develop understanding of the procedure of construction, repair, replacement and maintenance of water supply systems.
- To provide understanding of the socio-economic aspect of water supply and sanitation (WSS).

SHORT DESCRIPTION

Introduction; Water requirements; Sources of water; Water pipes; Collection and transmission of water; Quality of water; Treatment of water (clarification); Treatment of water (filtration); Treatment of water (disinfection and softening); Miscellaneous water treatment; Water distribution; Water reservoir; Distribution system; Rural water supply system; Plumbing system.

DETAIL DESCRIPTION

Theory:

1. Understand the concept of water supply engineering.

- 1.1 Define water supply engineering.
- 1.2 Explain the scope of water supply engineering.
- 1.3 Describe the importance and necessity of planned water supply.
- 1.4 Describe the water supply and its impact on public health and environment.
- 1.5 Explain the components of water supply system (Rural and Urban).

2. Understand the various aspects of consumption of water.

- 2.1 Describe population prediction and various methods of population forecast.
- 2.2 Describe the various needs for clean water and list the quantities required for those purposes.
- 2.3 Explain the influence of the factors which affect per capita consumption of water:
 - a. Size of city
 - b. Characteristics of population
 - c. Industries and commercial organization
 - d. Climatic condition
 - e. Metering of water
- 2.4 Explain the demand of water for fire fighting and fire stand post.

3. Understand the different sources of water.

- 3.1 Identify different sources of water.
- 3.2 Explain the hydrological cycle.
- 3.3 State the advantages and disadvantages of ground water.
- 3.4 Mention the advantages and disadvantages of surface water.
- 3.5 Distinguish between the ground water supply and surface water supply in respect to quality of water.
- 3.6 Explain rainwater harvesting

4. Understand the different type of pipes & pipe joints used in water supply and the reasons for corrosion in metal pipes.

- 4.1 Classify the different type of pipes according to size, materials, quality, and allowable stresses used in Bangladesh.
- 4.2 Explain the causes of corrosion of metal pipes.
- 4.3 Describe the methods of prevention and protection against corrosion.
- 4.4 Explain the causes of deterioration in non-metal pipes.
- 4.5 Describe with sketches the different joints used in pipes.
- 4.6 Describe with sketches the fittings of pipes and valves used.

5. Understand the collection and transmission system of water.

- 5.1 Identify the different types of intake used in collecting surface water.
- 5.2 Describe the different intake systems with sketches.
- 5.3 Classify the different type of pumps used in water supply.
- 5.4 Explain the uses and limitations of different type of pumps.
- 5.5 Distinguish between turbine pump and submersible pump used in deep tube well.

6. Understand the safe water and various types of impurities in water.

- 6.1 Define safe water
- 6.2 Mention the common water borne diseases.
- 6.3 Describe the contamination of water due to cross connection and plumbing defects, storage and back syphonge.
- 6.4 State the different type of impurities present in water.
- 6.5 Explain the causes of turbidity, color, taste and odor in water.
- 6.6 Mention the effects and maximum allowable limits (WHO & BSTI) of impurities (pH, colour, Turbidity, TDS, SS, Hardness, chloride, Nitrate, Iron, Sodium, Arsenic, Cadmium, lead, total coliform and faecal coliform) in water.
- 6.7 Explain the causes and effects of alkalinity, acidity and hardness in water.
- 6.8 Describe the effects of gaseous impurities (carbon di-oxide, hydrogen sulphide, dissolved oxygen) in water.
- 6.9 Mention the causes and effects of nitrate (methemoglobinemia) and lead poisoning (plumbism) in water.

7. Understand the treatment of water by clarification.

- 7.1 Explain a typical flow diagram of treatment plant units.
- 7.2 Outline the need of screening of water.
- 7.3 Mention the principle of plain sedimentation.
- 7.4 Mention the principle of sedimentation with coagulation.
- 7.5 State different types of coagulants with their purpose and action.
- 7.6 Describe the process of flocculation.
- 7.7 Describe a typical sketch of sedimentation tank.

8. Understand the treatment of water by filtration.

- 8.1 Explain the need of filtration of water.
- 8.2 State the theory of filtration of water for bacteriological removal.
- 8.3 Explain the characteristics between the slow sand filter and rapid sand filter.
- 8.4 Describe the operation difficulties of slow sand and rapid sand filters.
- 8.5 State the meaning of negative head and mud balls.

9. Understand the treatment of water by disinfection and softening.

- 9.1 Describe disinfection of water by chlorination.
- 9.2 Explain the advantages and limitations of disinfection of water by chlorination.
- 9.3 Compare the pre-chlorination, post chlorination, double chlorination and super chlorination.
- 9.4 Explain the advantages of break point chlorination.
- 9.5 Describe the following methods of disinfection of water:
 - a. Heating and boiling
 - b. pH control
 - c. Using oxidizing agent
 - d. Ultra violate Ray
 - e. Ozone
- 9.6 Distinguish between hard and soft water.
- 9.7 List different processes of water softening.

10. Understand the different processes of removing color, odor, taste, arsenic, iron, manganese and salinity.

- 10.1 Explain the purpose of aeration.
- 10.2 Describe the different methods of aeration.
- 10.3 Describe the process of removal of color, odor and taste by activated carbon.
- 10.4 Explain the different methods of removing arsenic, iron and manganese with flow diagram.
- 10.5 List the different methods of desalination of water.

11. Understand the different water distribution methods, construction and maintenance.

- 11.1 State the different features of the distribution systems.
- 11.2 Describe with the help of sketches the different methods of supply of water.
- 11.3 Outline the advantages and disadvantages of different methods of supply of water.
- 11.4 Describe with sketches the different layout methods of distribution pipes.
- 11.5 Explain the relative advantages and disadvantages of different layout methods of distribution pipes.
- 11.6 State the different types of-
 - a. Meter
 - b. Valves
 - c. Fire hydrant
 - d. Pipe & Fittings.
- 11.7 Describe the procedure of excavation and back filling for laying pipe lines.
- 11.8 Describe the procedure for-
 - a. handling and laying pipes and their maintenance
 - b. placing and maintenance of hydrants and valves
 - c. cleaning of water mains and use of washout system.

12. Understand different types of reservoir.

- 12.1 Mention the different types of reservoir according to position and shape.
- 12.2 Explain the needs of roof tank and typical water reservoir in a building.
- 12.3 Describe the typical section of roof tank and water reservoir in a building.

13. Understand the water supply systems with specific reference to rural Bangladesh

- 13.1 Give introduction to different types of hand pumps: No. 6 hand pump, deep-set (Tara) pump.

- 13.2 Describe the procedure of drilling, aquifer selection, back filling and installation techniques including developing of new tube well.
- 13.3 Explain the design procedure of tube well strainer.
- 13.4 Describe operation & maintenance of No. 6 hand pumps and deep-set (Tara) hand Pumps.
- 13.5 Explain the drilling problems in rocky areas.
- 13.6 Give introduction to alternative technologies in problem areas of Bangladesh: Shallow Shrouded Tube well (SST), Very Shallow Shrouded Tube well (VSST), Pond Sand Filter (PSF), Infiltration Galleries (IG), Iron Removal Unit (IRU) and Deep-set technologies.

14. Understand the importance of plumbing system.

- 14.1 Define plumbing system.
- 14.1.1 List the requirements of plumbing installation.
- 14.1.2 Identify with sketches the various plumbing fittings and fixtures.
- 14.1.3 Describe the uses of various plumbing fittings and fixtures.
- 14.1.4 Differentiate between plumbing fittings and fixtures.
- 14.1.5 List the tools required for plumbing works.
- 14.1.6 Mention the uses and maintenance of various plumbing tools.

15. Understand the effect of socio-economic factors on water supply and sanitation.

- 15.1.1 Describe the socio-economy of rural and urban area in Bangladesh.
- 15.1.2 Give definitions of demographic characteristics, power structure, cultural Issues (traits), rural leadership and local government structure.
- 15.1.3 Describe the influence of socio-economic aspects on community water Supply and sanitation.

PRACTICAL:

1. Identification of pipes and fittings.

- 1.1 Identify physically different type of pipes, fittings and joints.
- 1.2 Draw the sketches of typical plumbing fittings.
- 1.3 Cut pipes and cut a thread on the pipe.
- 1.4 Inspect installations to identify good and poor quality materials and workmanship

2. Demonstration of water purification plant and deep tube well.

- 2.1 Draw flow diagram of water purification processes after visiting a plant.
- 2.2 Draw section through a deep tube well.
- 2.3 Identify the major precautions needed during installation and use of deep tube well.

3. Maintenance works.

- 3.1 Identify, take out and replace unserviceable fixtures/ fittings or any other component parts.
- 3.2 Identify the common troubles of submersible pump and their solutions after visiting pump house.
- 3.3 Identify the common troubles in water supply pipe lines and their solution by visiting concern authorities (WASA, City Corporation and Pourashava).

4. Conduct physical and chemical tests of water.

- 4.1 Conduct physical tests of water (pH value & turbidity) using field pH and turbidity meter.
- 4.2 Conduct chemical tests of water (iron, manganese and chloride) using field kits.
- 4.3 Conduct the arsenic test of water using field kits.
- 4.4 Conduct residual chlorine test using field kits.
- 4.5 Conduct hardness test using field kits.

5. Physically identify different parts of

- a) No. 6 hand pump,
- b) Deep-set (Tara) hand pumps.
- c) Submersible pump

6. Inspect installation of

- a) No. 6 hand pump,
- b) Deep-set (Tara) hand pumps.
- c) Submersible pump

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1. Rangawala, S.C(2009): Water supply and sanitation. (Environmental Engineering)
2. Azizul, Syed Haq (2006): Plumbing Practices.
3. Feroze, M. Ahmed & Mujibur, M. Rahman (2000): Water Supply & Sanitation: Rural And Low Income Urban Communities, ITN-Bangladesh Publication.
4. Plumbing (1991): Technical Teachers Training College Publication.
5. Aziz, M.A (1975) : Water supply and sanitation.

66454**Theory of Structure**

T	P	C
2	3	3

AIMS

- To be able to consolidate and extend the fundamental understanding of the behavior of statically determinate structures i.e. beams, frames etc.
- To be able to develop of awareness of structural behavior such as deflection and stability of masonry dam.
- To be able to develop understanding for selection of suitable section of beam and member of the truss.

SHORT DESCRIPTION

Shear force and bending moment of beams; Stresses in beams; Deflection of beams; Joints and connections; Forces in frames; Steel structure; Masonry dam; Column; Moving loads; Thin Cylindrical shells.

DETAIL DESCRIPTION**Theory:****1. Understand shear force and bending moment of beams.**

- 1.1 Define determinate, indeterminate and homogeneous structure.
- 1.2 Mention different types of support condition.
- 1.3 Explain the relations between shear force and bending moment.
- 1.4 Define dangerous section and point of contra flexure.
- 1.5 Solve problems on SF and BM of cantilever beam with concentrated load, distributed load, inclined load and combined loads.
- 1.6 Solve problems on SF and BM of simply supported beam with concentrated load, distributed load, inclined load and combined loads.
- 1.7 Solve problems on SF and BM of overhanging beam with concentrated load, distributed load, inclined load and combined loads.

2. Understand the bending stresses in beams.

- 2.1 State the meaning of bending stresses in beam.
- 2.2 List the assumptions of bending stresses in beam.
- 2.3 Differentiate between bending moment and bending stress.
- 2.4 Express and derivation of the formula for bending stress.
- 2.5 State the meaning of elastic section modulus.
- 2.6 Solve problems on section modulus of circular, rectangular, I, T, L and hollow sections of beams.
- 2.7 Solve problems on bending stresses of circular, rectangular, I, T, L and hollow sections of beams.

3. Understand the shearing stresses in beams.

- 3.1 State the meaning of shearing stresses in beam
- 3.2 Differentiate between maximum and average shear stress.
- 3.3 Relate maximum shear stress and average shear stress for rectangular, circular and triangular section.
- 3.4 Express the derivation of the formula for shearing stress.
- 3.5 Solve problems on shearing stresses of circular, rectangular, I, T, L and hollow sections of beams.
- 3.6 Determine the section of homogeneous beam with respect to shearing stress and bending stress.

4. Understand the deflection of beams.

- 4.1 Define the meaning of deflection of beam and elastic curve.
- 4.2 List the assumptions of deflection of beam.
- 4.3 State the maximum allowable deflection for RCC beam, RCC slab and steel beam.
- 4.4 Express the derivation of equation for elastic curve
- 4.5 State the 1st and 2nd area moment proposition.
- 4.6 Compute the slope of elastic curve for cantilever beam with concentrated and distributed load.
- 4.7 Compute the maximum deflection for cantilever beam with concentrated and distributed load.
- 4.8 Compute the slope of elastic curve for simply supported beam with symmetrically concentrated and distributed load.
- 4.9 Compute the maximum deflection for simply supported beam with symmetrically concentrated and distributed load.

5. Understand the concept of steel structure and joints.

- 5.1 Define steel structure.
- 5.2 Describe joint and connections of steel structure.
- 5.3 State the differences between cold rolled and build up section.
- 5.4 Name the elements of pre-fabricated building.
- 5.5 Define pitch, back pitch and repeating section.
- 5.6 State the necessity of joints.
- 5.7 Classify joints and state efficiency of joints.
- 5.8 Explain the modes of failure and remedial measures of riveted joints.
- 5.9 Solve problems on simple lap joint and butt joint subjected to axial load only.

6. Understand the significance of welded connections.

- 6.1 Define terms: Fillet, Leg, Throat.
- 6.2 State the significance of welded connections.
- 6.3 Classify different types of welded connections.
- 6.4 Mention the merits and demerits of welded connections.
- 6.5 Solve problems on fillet weld connection subjected to axial load only.
- 6.6 Solve problems on butt weld connection subjected to axial load only.

7. Understand the action of forces in steel frames.

- 7.1 Define the terms: truss, tie, strut, redundant, deficient, web and chord member, perfect, imperfect frame.
- 7.2 Mention different types of roof trusses, bridge trusses and beams.
- 7.3 State the fundamental assumptions in trusses.
- 7.4 Describe the methods of computing forces in trusses.
- 7.5 Determine the forces on frames for warren truss, cantilever and Howe truss with dead load by Analytical (joint and moment) method.
- 7.6 Determine the forces on frames for warren truss, cantilever and Howe truss with dead load by graphical method.

8. Understand the stability of masonry dam.

- 8.1 Define dam and mention the functions of a dam.
- 8.2 Mention the different types of dam.
- 8.3 Explain the stability of a masonry dam.
- 8.4 State the meaning of middle third law.
- 8.5 Express the derivation of the equation for minimum width of the base for just no tension.

- 8.6 Calculate the maximum and minimum pressure on the foundation bed for rectangular dam
- 8.7 Calculate the maximum and minimum pressure on the foundation bed for trapezoidal dam having water face vertical only.
- 8.8 Solve problems on stability of the dam.

9. Understand the elastic buckling of columns.

- 9.1 State the meaning of short and long column.
- 9.2 Mention the type of columns on the basis of end conditions.
- 9.3 Compare the equivalent length of different columns.
- 9.4 Interpret the Euler's formula for flexural buckling of a pin ended strut/column.
- 9.5 Calculate the safe load on column using Euler's formula.
- 9.6 State the Rankin-Gordon formula.
- 9.7 Calculate the safe load on column using Rankin-Gordon formula.

10. Understand the concept of moving loads.

- 10.1 State the meaning of moving load.
- 10.2 Classify different types of moving loads.
- 10.3 State the meaning of influence line.
- 10.4 Draw influence line for single concentrated load and reaction of a simply supported beam.

11. Understand the concept of Thin Cylindrical Shells.

- 11.1 Define cylindrical shell.
- 11.2 Failure of a cylindrical shell due to an internal pressure.
- 11.3 Stresses in a thin cylindrical shell.
- 11.4 Circumferential stress.
- 11.5 Longitudinal stresses.
- 11.6 Design of thin cylindrical shells

PRACTICAL:

1. Determine shear force & bending moment at different sections of simply supported beam with different types of load and draw the diagrams.
2. Determine shear force & bending moment at different sections of overhanging beam with different types of load and draw the diagrams.
3. Determine the position of dangerous section and inflection point or point of contra flexure of overhanging beam and show in diagram.
4. Determine the bending stresses of circular, rectangular & hollow sections of beams and draw the diagrams.
5. Determine the bending stresses of I, T, L sections of beams and draw the diagrams.
6. Determine the shearing stresses of circular and rectangular sections of beams and draw the diagrams.
7. Determine the shearing stresses of I & T sections of beams and draw the diagrams.
8. Determine the section of homogeneous beam with respect to shearing stress and bending stress.
9. Determine the deflection of cantilever and simply supported beam with respect to concentrated/distributed load.
10. Draw the neat sketches of different type of riveted joints showing the mode of failures.
11. Determine the forces developed on the member of a truss graphically.
12. Prepare some models of different types of truss with suitable materials.
13. Draw a sketch of a pre-fabricated building and show the different elements in the figure.

REFERENCE BOOKS

- | | |
|-----------------------------------------|--------------------------|
| 1. Theory of simple structure | - T C Shed and J Vawter |
| 2. Strength of materials and structures | - J Case and A H Chilver |
| 3. Theory of structures | - R S Khurmi |
| 4. Strength of Materials | - R S Khurmi |
| 5. Steel Structure | - Gay Lord |

66455

Estimating & Costing-II

T P C
2 3 3

AIMS

- To be able to understand the estimating of framed structure multi-storied building.
- To be able to understand the estimating of roof truss, bridge & culvert and deep tube well.
- To be able in preparation of the specification and tender documents of civil engineering works.
- To be able to understand the public works account and forms.
- To be able to improve knowledge and skill of rate analysis process for different Items of work in building construction as per PWD standard.
- To be able to understand the valuation property and building.

SHORT DESCRIPTION

Estimate of multi-storied framed structure building i/c Sanitary works; Culvert & Bridge; Reinforced cement concrete retaining wall; Roof truss; Steel Structure; Deep tube well; Preliminary estimate for building project work according to plinth area rate; Rate analysis and valuation of property. Bar schedule of beam, column, one way & two way slab.

DETAIL DESCRIPTION

Theory:

1. Understand the components and item of works of Multi- storied framed structure building.

- 1.1 Define framed structure building.
- 1.2 Define substructure and superstructure of a building.
- 1.3 Differentiate between structural and non-structural member in a framed structure building.

2. Understand the earth work, brick flat soling and cement concrete in foundation and plinth.

- 2.1 State the way of calculating earth work in excavation for foundation trenches.
- 2.2 State the way of calculating earth work in filling of foundation trenches.
- 2.3 State the way of calculating earth work in filling plinth for rooms and verandah.
- 2.4 State the way of calculating brick flat soling in foundation and floors.
- 2.5 State the way of calculating mass concrete work in foundation and floors.

3. Understand the reinforced cement concrete work in different items of building

- 3.1 State the method of calculating R.C.C work in different types of column with footing. (i.e. square, L-shaped, T- shaped, I-shaped and circular section column with block and sloped spread footings and quantity of reinforcement i/c bar schedule and formworks).
- 3.2 State the method of calculating quantity of R.C.C work and reinforcement (i/c bar schedule), formworks for R.C.C work in all types of beam, lintel, one way and two way slab, cantilever and porch slab.
- 3.3 State the method of calculating R.C.C work in sun shed, shelves, railing, drop wall, etc.
- 3.4 State the method of calculating R.C.C work in stair and quantity of reinforcement i/c bar schedule and formworks.

4. Understand the brick work and cement plaster work in foundation and superstructure.

- 4.1 Mention the unit of brick work (half having half brick thick wall) in partition walls.
- 4.2 State the method of calculating cement plaster work on inner side and outer side of brick wall.

4.3 State the method of calculating cement plaster work over reinforced cement concrete surfaces such as: column, lintel, beam, ceiling, sun shed, shelf, railing, drop wall, fins or louvers and stair etc.

5. Understand the wood work in different types of doors and windows with grill works.

5.1 Mention the unit of wood works in door and window shutters.

5.2 State the method of calculating wood work in door frames.

5.3 State the method of calculating wood work in door shutters.

5.4 State the method of calculating wood work in window frames.

5.5 State the method of calculating wood work in window shutters.

5.6 State the method of calculating the steel/aluminum frame and shutters of doors and windows i/c glass fiber shutter.

5.7 Mention the unit of grill works.

5.8 Calculate grill works in window and verandah.

5.9 Calculate the quantity of M.S, S.S, Aluminum bar etc. for grill/frame work as per detail drawing.

6. Understand the patent stone flooring, mosaic work, tiles & skirting.

6.1 State the method of calculating patent stone flooring.

6.2 State the method of calculating tiles work in floor and wall.

6.3 State the method of calculating mosaic work on floor.

6.4 State the method of calculating skirting work.

6.5 Calculate the quantity of floor tiles, wall tiles and mosaic work.

7. Understand the lime terracing work over RCC roof slab.

7.1 State the method of calculating lime terracing work.

7.2 List the materials required for lime terracing work.

7.3 Calculate the quantity of lime terracing work.

8. Understand the surface finishing works of building.

8.1 State the method of calculating white wash (inside only) and color wash (outside only).

8.2 State the method of calculating wall and ceiling paper.

8.3 State the method of calculating distemper (inside only).

8.4 State the method of calculating plastic emulsion paint (inside only).

8.5 State the method of calculating snowcem wash and weather coat (outside only).

8.6 State the method of calculating synthetic enamel paint to doors and windows.

8.7 State the method of calculating synthetic enamel paint to grills.

8.8 State the method of calculating synthetic enamel paint to skirting.

8.9 State the method of calculating varnishing / French polish to wooden doors and windows.

9. Understand the estimate of septic tank.

9.1 State the different items of work in septic tank and soak well.

9.2 State the way of calculating earth work in excavation for septic tank and soak well.

9.3 State the method of calculating brick work in septic tank and soak well.

9.4 State the method of calculating RCC and CC work in septic tank and soak well.

9.5 State the method of calculating cement plaster work in septic tank and soak well.

9.7 Calculate the different items of work in septic tank and soak well.

10. Understand the estimate of RCC retaining wall and RCC culvert.

10.1 State the way of calculating earth work in excavation for foundation trenches of RCC retaining wall.

10.2 State the method of calculating mass concrete and RCC work in RCC retaining wall.

- 10.3 State the method of calculating back filling work in RCC retaining wall.
- 10.4 State the method of calculating and make bar schedule of M.S bar.
- 10.5 State the way of calculating earth work in excavation for foundation trenches of culvert.
- 10.6 State the method of calculating brick work, mass concrete and RCC work in culvert.
- 10.7 State the method of calculating cement plaster work in culvert.
- 10.8 State the method of calculating earth filling work in culvert.

11. Understand the estimate of roof truss (wooden & steel).

- 11.1 State the different items of work of roof truss.
- 11.2 State the way of calculating the quantities of wood required in a roof truss.
- 11.3 State the way of calculating the quantities of steel required in a roof truss.
- 11.4 Mention the standard lapping at end & sides of CI sheet for roofing.
- 11.5 State the way of calculating the quantities of CI sheet for roof covering.
- 11.6 State the way of calculating the quantities of GI ridging.
- 11.7 State the way of calculating the painting works of roof truss.
- 11.8 Calculate the different items of work of wooden roof truss.
- 11.9 Calculate the different items of work of steel roof truss.

12. Understand the estimation of steel structure (vertical iron column).

- 12.1 Identify the different components and accessories of steel structure.
- 12.2 State the way of calculating the quantities of steel (iron) required in steel structure.
- 12.3 State the way of calculating the quantities of gusset plate, bolts and nuts used in steel structure.
- 12.4 State the way of calculating the painting work of steel structure.

13. Understand the estimation of plumbing and sanitary works.

- 13.1 State the method of estimate plumbing and sanitary works.
- 13.2 Name the different fittings and fixtures required for water supply and sanitary works
- 13.3 Describe the method of estimation the drainage works of a buildings.

14. Understanding the process of analysis of rates of various items of work as per PWD standard.

- 14.1 State the requirements of rate analysis.
- 14.2 Mention the important factors that affect the analysis of rates.
- 14.3 Describe the procedure of rate analysis to calculate the rate per unit of the item of works.
- 14.4 List the quantity of materials and the number of different categories of labour required for the following item of work and analysis the unit rate i/c contractors profit, tools and plants (T&P) over head expenses, income tax (IT) and value added tax (VAT) as per PWD standard.
 - a. Earth work in excavation for foundation trenches.
 - b. Earth and sand filling in foundation and plinth.
 - c. One layer brick flat soling in foundation and floor.
 - d. Cement concrete work (1:3:6) in foundation and floor.
 - e. Brick work in foundation up to plinth with 1:6 cement mortar.
 - f. 75 mm thick damp proof course (DPC) in proportion 1 :1.5: 3.
 - g. Brick work of 250 mm & above thick wall in superstructure with 1:6 cement mortar.
 - h. Brick work of 125mm thick wall in superstructure with 1:4 cement mortar.
 - I. RCC work in proportion 1:2:4 and 1:1.5:3 i/c shuttering cost (footing, grade beam, column below & above plinth, lintel & tie beam, roof beam, roof slab, Sun shade, railings, drop wall, shelves, parapet & stair slab etc.

- j. Mild steel reinforcement fabrication work in different types of RCC work for one quintal of work.
- k. Patent stone flooring in proportion 1:1.5:3 with neat cement finish.
- l. Average 12 mm thick cement plaster (1:6) to brick walls.
- m. Average 6 mm thick cement plaster (1:4) to RCC surface.
- n. Lime terracing work with proportion of 2:2:7 over roof slab.
- o. Teak wooden door frame and 38 mm thick paneled door shutter.
- p. Aluminum swing and sliding door and window.
- q. Steel glazed window shutter with Z- section, T- section, Fl bars etc.
- r. White washing, color washing, distempering, snowcem washing, plastic emulsion paint, synthetic enamel paint wherever necessary.
- s. Installation of European type commode & Indian type long pan (WC) with low level flushing tank, bath tub, wash hand basin, sink, squatting & standing urinals.

15. Understand the preliminary estimate for building project work according to plinth area rate.

- 15.1 State the meaning of preliminary estimate.
- 15.2 Mention the basis of calculating preliminary cost estimate of a building project work.
- 15.3 Describe the calculation procedure of preliminary cost estimate for building project work according to plinth area rate.

16. Understand the public works account and forms.

- 16.1 Name different methods of carrying out works.
- 16.2 Explain imprested account.
- 16.3 Describe the master roll part-I and part-II.
- 16.4 Describe the measurement book (MB).
- 16.5 Define bill and voucher.
- 16.6 Define running & final bill.
- 16.7 Describe the mode of payment.
- 16.8 Mention the duties of Sub-Assistant Engineer.
- 16.9 Describe PPA - 2008.

17. Understand valuation of property and building.

- 17.1 State the meaning of valuation of property.
- 17.2 Mention the necessity of valuation.
- 17.3 Define the following terms:

- a. Outgoings (Taxes, Repairs, Management and collection charges, sinking fund, loss and rent, Miscellaneous.)
- b. Municipal taxes.
- c. Scrap value.
- d. Salvage value.
- e. Market value.
- f. Book value.
- g. Rateable value.
- h. Obsolescence.
- i. Annuity.
- j. Capital cost.
- k. Capitalized value.
- l. Years purchase (YP).
- m. Sinking funds

- 17.4 Define the term valuation of building.
- 17.5 Describe the process to determine the cost of construction of a building.
- 17.6 Describe the process of valuation of a building.
- 17.7 Solve the problems related to a building from given data.

PRACTICAL:

- 1. Estimate the earth work in excavation and earth filling for foundation trenches.**
 - 1.1 Select a drawing of a two-storied framed structure building.
 - 1.2 Determine the length, breadth & height of foundation trenches of columns and bottom of grade beam (if necessary) & verandah walls.
 - 1.3 Calculate the quantity of earthwork in excavation in foundation trenches.
 - 1.4 Determine the length, breadth & height of filling in plinth.
 - 1.5 Calculate the quantity of earth work in filling plinth.
 - 1.6 Calculate the quantity of earth work in filling the sides of column foundation trenches & sides of grade beam (if necessary).
- 2. Estimate the brick flat soling & mass concrete in foundation and floor.**
 - 2.1 Determine the length & breadth for brick flat soling in foundation and floor.
 - 2.2 Calculate the total quantity of brick flat soling in foundation and floor.
 - 2.3 Determine the length, breadth & thickness of mass concrete in foundation and floor.
 - 2.4 Calculate the total quantity of mass concrete in foundation and floor.
- 3. Estimate the reinforced cement concrete work in foundation up to plinth level.**
 - 3.1 Determine the length, breadth & thickness of column footing.
 - 3.2 Calculate the quantity of RCC work in column footing.
 - 3.3 Determine the length, breadth & height of column up to plinth level.
 - 3.4 Calculate the quantity of RCC work in column up to plinth level.
 - 3.5 Determine the length, breadth & depth of grade beam.
 - 3.6 Calculate the quantity of RCC work in grade beam.
- 4. Estimate the reinforced cement concrete work in superstructure.**
 - 4.1 Determine the length, breadth & height of column, lintel, beam, floor slab/roof sunshed, shelve, railing, drop wall, fins or louvers, stair slab, steps, beam, landing slab in each floor.
 - 4.2 Calculate the quantity of RCC work in column in each floor.
 - 4.3 Calculate the quantity of RCC work in lintel in each floor.
 - 4.4 Calculate the quantity of RCC work in beam in each floor.
 - 4.5 Calculate the quantity of RCC work in sunshed, shelve, railing, drop wall, fins or louvers in each floor.
 - 4.6 Calculate the quantity of RCC work in stair slab, steps, beam, landing slab in each floor.
 - 4.7 Calculate the quantity of reinforcement in different items building with bar schedule.
- 5. Estimate the brick work in sub-structure (foundation up to plinth level) and superstructure.**
 - 5.1 Determine the length, breadth & height of brick walls up to plinth level.
 - 5.2 Calculate the quantity of brick work in sub-structure.
 - 5.3 Determine the length & height of one brick thick walls in superstructure in each floor.
 - 5.4 Calculate the quantity of brick work (one brick thick wall) in super structure in each floor (cum).
 - 5.5 Determine the length & height of partition wall (half brick thick wall) in super structure in each floor.
 - 5.6 Calculate the quantity of brick work (half brick thick wall) in super structure in each floor (sqm).
 - 5.7 Calculate the quantity of curtain wall of a high rise building i/c all accessories with aluminum frame.

6. Estimate the cement plaster work on brick walls and RCC surfaces.

- 6.1 Determine the length & height of brick walls (inner side, outer side).
- 6.2 Calculate the quantity of cement plaster on brick walls (inner side, outer side).
- 6.3 Calculate the quantity of deduction for doors, windows and verandah opening.
- 6.4 Calculate the total quantity of cement plaster on brick walls.
- 6.5 Determine the height & breadth of RCC columns, lintels, beams, ceiling, sunshed, shelve, railing, drop wall, fins or louver (both sides), soffit in stairs & bottom surface of landing slab.
- 6.6 Calculate the quantity of cement plaster on RCC columns.
- 6.7 Calculate the quantity of cement plaster on RCC lintels/beams.
- 6.8 Calculate the quantity of cement plaster to RCC ceiling.
- 6.9 Calculate the quantity of cement plaster to RCC stair case.

7. Estimate the wood and steel work in door and window frames and shutters.

- 7.1 Identify the different sizes of doors and windows.
- 7.2 Determine the length & sizes of doors and windows (wooden, steel / aluminum) frames.
- 7.3 Calculate the quantity of wood work in door and windows frames (cum).
- 7.4 Determine the breadth & height of door and windows shutters.
- 7.5 Calculate the quantity of door and windows shutters, wooden, steel and glass fiber. (sqm).

8. Estimate the grill works.

- 8.1 Identify the different sizes of windows.
- 8.2 Determine the breadth & height of window openings.
- 8.3 Calculate the quantity of grill works(sqm).
- 8.4 Determine the breadth & height of verandah openings.
- 8.5 Calculate the quantity of grill works(sqm).

9. Estimate the patent stone flooring, mosaic work, tiles & skirting.

- 9.1 Determine the length & breadth of rooms and verandah for patent stone flooring.
- 9.2 Calculate the quantity of patent stone flooring in each floor.
- 9.3 Determine the length & breadth of rooms for mosaic works.
- 9.4 Calculate the quantity of mosaic works in each floor.
- 9.5 Determine the length & breadth of rooms for tiles work.
- 9.6 Determine the length & height of walls for tiles work.
- 9.7 Calculate the quantity of tiles work in each floor.
- 9.8 Determine the length & height of walls for skirting works.
- 9.9 Calculate the quantity of skirting works in each floor.

10. Estimate the lime terracing over RCC roof slab.

- 10.1 Determine the length, breadth & thickness of lime terracing.
- 10.2 Calculate the quantity of lime terracing.
- 10.3 Find out the quantity of each material required for lime terracing.

11. Estimate the quantity of white wash, color wash, snowcem wash, distemper, plastic paint where necessary.

- 11.1 Determine the length & breadth or height of walls and ceiling.
- 11.2 Calculate the quantity of area for white washing.
- 11.3 Determine the length & height of outside walls for color wash.
- 11.4 Calculate the quantity of area for color washing.
- 11.5 Determine the length & height of outside walls for snowcem wash.
- 11.6 Calculate the quantity of area for snowcem washing.

11.7 Determine the length & breadth or height of walls and ceiling.

11.8 Calculate the quantity of area for distempering.

11.9 Determine the length & breadth or height of walls and ceiling.

11.10 Calculate the quantity of area for plastic emulsion painting.

12. Estimate the painting and varnishing works to doors, windows, grills and skirting.

12.1 Identify the different sizes of doors, windows and grills.

12.2 Determine the length & height of each type of doors, windows and grills.

12.3 Calculate the quantity of area for painting and varnishing.

12.4 Determine the length & height of walls for skirting.

12.5 Calculate the quantity of area for skirting works.

13. Prepare an estimate of a septic tank and soak well with allied connections & fixtures.

13.1 Select a detail drawing of septic tank and soak well for 100 users.

13.2 Determine the necessary dimensions for detail estimate.

13.3 Estimate the different items of work of septic tank and soak well such as earth work in excavation & filling, brick flat soling, CC & RCC in base & top slab, brick works, cement plaster, patent stone flooring including all fittings.

14. Prepare an estimate of a RCC slab culvert and two span box culverts.

14.1 Select a detail drawing of RCC slab culvert and two span box culverts.

14.2 Determine the length, breadth & height or thickness of different members of the RCC slab culvert and two span box culvert.

14.3 Estimate the different items of work of RCC slab culvert and two span box culvert such as earth work in excavation & filling, brick flat soling, CC & RCC in base & top slab, brick works, cement plaster etc.

15. Prepare an estimate of a RCC retaining wall.

15.1 Select a detail drawing of a RCC retaining wall.

15.2 Determine the length, breadth & height or thickness of stem and base of the retaining wall.

15.3 Estimate the quantity of RCC work in stem and base of retaining wall.

15.4 Determine the measurement of reinforcement of the retaining wall.

15.5 Calculate the quantity of reinforcement required for the retaining wall.

16. Prepare an estimate of a wooden truss with CI sheet roofing.

16.1 Select a detail drawing of a king post roof truss.

16.2 Determine the length & sizes of different members of the truss.

16.3 Calculate the quantity of wood required for the truss in cum.

16.4 Determine the measurements of roofing area of the truss.

16.5 Calculate the quantity of CI sheet roofing in bundle / sqm.

16.6 Calculate the quantity of GI ridging in rm.

16.7 Calculate the quantity of painting works of the truss.

17. Prepare an estimate of a steel truss with CI sheet roofing.

17.1 Select a detail drawing of a steel truss.

17.2 Identify the length, sizes & thickness of different members of the truss.

17.3 Determine the measurements of each of the member of the truss.

17.4 Calculate the total quantity of steel required in kilogram/quintal/ton.

17.5 Determine the measurements of roofing area of the truss.

17.6 Calculate the quantity of CI sheet roofing in bundle / sqm.

- 17.7 Calculate the quantity of GI ridging in rm.
- 17.8 Calculate the quantity of painting works of the steel truss.

18. Prepare the cost of abstract of wooden & steel roof truss.

- 18.1 Identify the local rate of timber & other materials and labours for wooden truss.
- 18.2 List the items of work of a wooden truss.
- 18.3 Calculate the cost of abstract for wooden truss as per present market rate.
- 18.4 Identify the local rate of steel & other materials and labours for steel truss.
- 18.5 List the items of work of a steel truss.
- 18.6 Calculate the cost of abstract for steel truss as per present market rate.

19. Prepare an estimate of a steel structure.

- 19.1 Select a detail drawing of a steel structure.
- 19.2 Identify the length, sizes & thickness of different members of the steel structure.
- 19.3 Determine the measurements of each of the member of the steel structure.
- 19.4 Calculate the total quantity of steel required in kilogram/quintal/ton.
- 19.5 Calculate the quantity of painting works of the steel structure.

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1. A Text Book of Estimating and Costing - by G S Birdie
2. Civil Estimating Quantity Surveying and Valuation - by Amarjit Agarwal
3. Estimating and Costing - by S C Rangwala
4. Estimating and Costing in civil engineering theory and practice - by B.N. Dutta
5. Tender documents of any building project prepared by Bangladesh Public Works Department (BPWD) or any other govt. organizations or any reputed civil engineering consulting firms in Bangladesh.

66456

Hydraulics

T	P	C
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AIMS

- To enable to understand the behavior of incompressible fluids.
- To enable to understand the fundamentals of buoyancy.
- To enable to understand flow of liquid in closed system and in open channel.
- To assist in identifying the common measuring instruments / apparatus used in measuring the various parameters of flowing liquid.
- To enable to applying the common measuring instruments / apparatus in measuring the various parameters of flowing liquid.

SHORT DESCRIPTION

Fluid pressure; Buoyancy; Principles of flow of fluid; Flow through orifices and mouthpieces; Losses of head of flowing liquid; Friction and flow through pipes; Flow of liquid through notches and weirs; Flow of liquid through open channel; Measurement of velocity of flow by current-meter and float.

DETAIL DESCRIPTION

1. Understand the basic concept of fluid and its properties.

- 1.1 Define fluid, liquid, gases, fluid mechanics and hydraulics.
- 1.2 Differentiate fluid, liquid and gases.
- 1.3 Define density of fluid and specific weight.
- 1.4 Mention the application of hydraulics.

2. Understand the aspects of fluid pressure.

- 2.1 State the meaning of intensity of pressure.
- 2.2 State the meaning of pressure head and static head of liquid.
- 2.3 Define free surface of liquid, atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure.
- 2.4 Compute the intensity of pressure and total pressure at the base / side wall of a tank full of water.
- 2.5 Identify hydraulic ram and plunger.
- 2.6 Explain the working principle of a hydraulic ram.
- 2.7 Calculate the weight lifting capacity of ram.

3. Understand the technique of measuring the fluid pressure.

- 3.1 Define piezometer, manometer, differential manometer and inverted differential manometer.
- 3.2 Outline the specific uses and limitations of each of the fluid pressure measuring devices in 3.1.
- 3.3 Compute liquid pressure using piezometer.
- 3.4 Compute liquid pressure using simple manometer.
- 3.5 Compute difference of fluid pressure between two sections of a pipe line using differential manometer.
- 3.6 Compute difference of fluid pressure between two sections of a pipe line using inverted differential manometer.

4. Understand the concept of total pressure and center of pressure on immersed plane surface.

- 4.1 Explain total pressure and center of pressure on an immersed plane surface.
- 4.2 Explain total pressure and center of pressure on an immersed inclined plane surface.

- 4.3 Express the deduction of formula for computing total pressure and center of pressure on a vertically immersed plane surface.
- 4.4 Express the deduction of formula for computing center of pressure on an inclined immersed surface.
- 4.5 Compute total pressure and center of pressure on a vertically immersed plane surface.
- 4.6 Compute total pressure and center of pressure on an inclined immersed surface.

5. Understand the fundamental concepts of buoyancy.

- 5.1 Define buoyancy and center of buoyancy.
- 5.2 State metacentre and metacentric height.
- 5.3 Mention the conditions of equilibrium of a floating body.
- 5.4 Compute the metacentric height using experimental formula.

6. Understand the principles of flow of liquid under different conditions.

- 6.1 Define various types of flow such as: laminar flow, turbulent flow, steady flow, unsteady flow, uniform flow, non-uniform flow, incompressible flow, rotational flow, irrotational flow, continuous flow.
- 6.2 Explain the term discharge.
- 6.3 State the equation of continuity of liquid flow.
- 6.4 Explain datum head, velocity head, pressure head and total head of a liquid.

7. Understand the concept of Bernoulli's theorem.

- 7.1 State the Bernoulli's theorem.
- 7.2 Prove the Bernoulli's theorem.
- 7.3 Describe construction of venturimeter and pitot tube.
- 7.4 Compute the discharge in a given pipe line by using venturimeter.
- 7.5 Compute velocity and discharge in a section of a flowing liquid by using a pitot tube.

8. Understand the aspects of flow through orifice and mouthpiece.

- 8.1 Define the terms: orifice, jet of water and venacontracta.
- 8.2 State the meaning of coefficient of contraction (C_c), coefficient of velocity (C_v), coefficient of discharge (C_d).
- 8.3 State the relation between C_c , C_v and C_d .
- 8.4 Calculate the time of emptying a rectangular tank and hemispherical vessel through orifice.
- 8.5 Define the term mouthpiece.
- 8.6 Explain the functions of a mouthpiece.
- 8.7 Distinguish between external and internal mouthpieces.

9. Understand the aspects of different types of losses of head of flowing liquid.

- 9.1 Define loss of head of flowing fluid.
- 9.2 Explain different types of losses of head of flowing liquid such as:
 - a) Loss of head due to friction.
 - b) Loss of head due to bend and elbows.
 - c) Loss of head due to sudden enlargement.
 - d) Loss of head due to sudden contraction.
 - e) Loss of head at entrance to pipe.
 - f) Loss of head due to obstruction.
- 9.3 Calculate loss of head due to friction.

10. Understand the aspects of friction and flow through pipes.

- 10.1 Describe friction of fluid flowing through pipes.
- 10.2 State the Chezy's formula for loss of head due to friction in pipes.
- 10.3 State the Darcy's formula for loss of head due to friction in pipes.
- 10.4 Calculate the loss of head due to friction in pipes using Chezy's formula.
- 10.5 Calculate the loss of head due to friction in pipes using Dracy's formula.

11. Understand the principle of flow through notches.

- 11.1 Describe notch.
- 11.2 Identify different types of notches.
- 11.3 Outline the advantages of triangular notch over rectangular notch.
- 11.4 State the formulae for measuring discharges through rectangular notch, V-notch and trapezoidal notch.
- 11.5 Calculate the discharges through rectangular notch using discharge formulae.
- 11.6 Calculate the discharges through triangular notch using discharge formulae.
- 11.7 Calculate the discharges through trapezoidal notch using discharge formulae.

12. Understand the principle of flow through weirs.

- 12.1 Describe weir.
- 12.2 Outline the differences between weir and notch.
- 12.3 State Francis' formula for discharge through a rectangular weir.
- 12.4 State Bazin's formula for discharge through a rectangular weir.
- 12.5 Calculate the discharges through rectangular weir using Francis' formula.
- 12.6 Calculate the discharges through rectangular weir using Bazin's formula.

13. Understand the aspects of flow of liquid through open channel.

- 13.1 Describe open channel, wetted perimeter, hydraulic radius, Laminar and turbulent flow, Reynold's number, hydraulic jump, critical depth, Critical velocity and hydraulic gradient.
- 13.2 State the different types of open channels.
- 13.3 State the Chezy's formula for velocity of flow in open channel.
- 13.4 State the Manning's formula for velocity of flow in open channel.
- 13.5 Select the conditions for most economical section of a rectangular channel.
- 13.6 Mention the uses of current meter and float to determine velocity of flow.
- 13.7 Measurement of velocity of flow by current meter and float.

PRACTICAL:

1. Measure pressure at a particular section / point of a tank or pipe line:
 - a) by a piezometer.
 - b) by a simple manometer.
2. Measure difference of pressure between two sections of a flowing liquid:
 - a) by differential manometer.
 - b) by inverted differential manometer.
3. Demonstrate proof of Bernoulli's theorem.
4. Measure discharge through a pipe line by venturimeter.
5. Determine coefficient of discharge (C_d), coefficient of velocity (C_v) and coefficient of contraction (C_c).
6. Measure discharge through a triangular notch (V-notch) and determine the coefficient of discharge.
7. Determine the co-efficient of friction in GI and PVC pipe.

8. Measure the loss of head due to friction in pipe.
9. Measure the loss of head due to sudden enlargement and sudden contraction of pipe.
10. Observe different types of flow in a typical open channel.
11. Measure velocity of flow in a typical open channel by :
 - a) a current meter.
 - b) a float.
 - c) a pitot tube.
12. Observe hydraulic jump in a typical open channel due to obstruction of flow by a weir and measure the depth of the jump.

REFERENCE BOOKS

1. Hydraulics – E. H. Lewitt
2. A text book of Hydraulics – R. S. Khurmi
3. Hydraulics – H. W. King

65851

Accounting Theory & Practice

T P C
2 3 3

AIMS

- To be able to understand the principles and practices of book keeping and accounting.
- To be able to understand the procedures of general accounting, financial accounting and their applications.
- To be able to understand the concept of income tax , VAT & Public works accounts.

Course Outlines

Concept of book keeping and accounting; Transactions; Entry systems; Accounts; Journal; Ledger; Cash book; Trial balance; Final accounts; Cost account & financial accounting; Income Tax; Public works accounts.

DESCRIPTION;

Theory

1. Concept of book keeping and accounting.

- 1.1 Define book keeping and accountancy.
- 1.2 State the objectives & of book keeping.
- 1.3 State the advantages of book keeping.
- 1.4 Differentiate between book keeping and accounting.
- 1.5 State the necessity and scope of book keeping and accounting.

2. Transactions Analysis.

- 2.1 Define transactions and business transaction.
- 2.2 Describe the characteristics of transaction.
- 2.3 Discuss the classification of transaction.

3. Entry system of Accounting.

- 3.1 State the aspects of transactions.
- 3.2 Define single & double entry system ..
- 3.3 Discuss the principles of double entry system.
- 3.4 Distinguish between single entry and double entry system of book keeping.
- 3.5 Justify whether double entry system is an improvement over the single entry system.

4. Classification of accounts.

- 4.1 Define accounts.
- 4.2 State the objectives of accounts.
- 4.3 Illustrate different type of accounts with example.
- 4.4 Define “Golden rules of Book keeping”.
- 4.5 State the rules for “Debit” and “Credit” in each class of accounts.
- 4.6 Define accounting cycle.

5. Journal .

- 5.1 Define Journal.
- 5.2 State the functions of Journal.
- 5.3 Mention the various names of Journal.
- 5.4 Interpret the form of Journal.

6. ledger.

- 6.1 Define ledger.
- 6.2 Interpret the form of ledger.
- 6.3 State the functions of ledger.
- 6.4 Distinguish between Journal and Ledger.
- 6.5 Explain why ledger is called the king of all books of accounts.
- 6.6 Explain the following terms: Balance, Balancing; Debit balance; credit balance.

7. Cash book & Its Classification.

- 7.1 Define cash book.
- 7.2 Classification of cash book.
- 7.3 Explain cash book as both Journal and Ledger.
- 7.4 Define discount.
- 7.5 Explain the different types of discount.

8. Trial balance.

- 8.1 Define trial balance.
- 8.2 State the object of a trial balance.
- 8.3 Discuss the methods of preparation of a trial balance.
- 8.4 Explain the limitations of a trial balance.
- 8.5 Prepare trial balance from given ledger balance. (practical)

9. Final accounts.

- 9.1 State the components of final account.
- 9.2 Distinguish between trial balance and balance sheet.
- 9.3 Select the items to be posted in the trading account, profit & loss account and the balance sheet.
- 9.4 State the adjustment to be made from the given information below or above the trial balance.
- 9.5 Explain the following terms: revenue expenditure; capital expenditure; depreciation; annuity method diminishing balance method, machine hour method

10. Cost and financial accounting.

- 10.1 Define financial accounting.
- 10.2 State the objectives of financial accounting.
- 10.3 Define cost accounting.
- 10.4 State the elements of direct cost and indirect cost.
- 10.5 Discuss the capital budgeting
- 10.6 Explain the following terms:
 - a. Fixed cost b. Variable cost c. Factory cost d. Overhead cost e. Process cost f. Direct cost g. Operating cost h. Standard cost

11. Income Tax

- 11.1 Define Income Tax.
- 11.2 State the objects of Income Tax.
- 11.3 Classification of assesses.
- 11.4.Taxable income of assesses.
- 11.5 Tax rebate.
- 11.6 Explain the following terms: Income tax year; assessment year,NBR.

12. Public works accounts.

- 12.1 State the important aspects of public works accounts.
- 12.2 Describe the main features of public works accounts.
- 12.3 Define Value Added Tax (VAT)
- 12.4 State the merits and demerits of VAT.
- 12.5 Explain the following terms :Revenue ; Grant ; Bill; Voucher.

PRACTICAL

1. Identify the transaction from given statements stating reasons.
2. Determine Debtor (Dr) and Creditor (Cr.) from given transactions applying golden rules.
3. Journalize from given transactions.
4. Prepare ledger from given transactions.
5. Prepare double column cash book from given transactions showing balances.
6. Prepare triple column cash book from given transaction and find out the balances.
7. Prepare analytical and imprest system of cash book.
8. Prepare trial balance from the given ledger balance.
9. Prepare trading account, profit & loss account and balance sheet from the given trial balance & other information.
10. Prepare cost sheet showing prime cost, factory cost, cost of production, total cost and selling price.

REFERENCE BOOKS

- | | |
|-------------------------------|--------------------------|
| 1. Book-keeping & Accounting | - Prof. Gazi Abdus Salam |
| 2. Principles of Accounting | - Hafiz uddin |
| 3. Cost Accounting | - Prof. Asimuddin Mondol |
| 4. হিসাবরক্ষণ ও হিসাববিজ্ঞান | - পরেশ মঙ্গল |
| 5. উচ্চ মাধ্যমিক হিসাববিজ্ঞান | - হক ও হোসাইন |
| 6. আয়কর | - ড. মনজুর মোরশেদ |



BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207

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

CIVIL TECHNOLOGY
TECHNOLOGY CODE: **664**

6th SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

CIVIL TECHNOLOGY (664)

6th SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total	
						Theory		Practical			
						Cont. assess	Final exam	Cont. assess	Final exam		
1	66461	Advance Surveying	2	6	4	40	60	50	50	200	
2	66462	Transportation Engineering-1	2	3	3	40	60	25	25	150	
3	66463	Design of Structure-1	2	3	3	40	60	25	25	150	
4	66464	Civil Engineering Drawing -3 (CAD)	1	6	3	20	30	50	50	150	
5	66465	Foundation Engineering	2	3	3	40	60	25	25	150	
6	66466	Civil Engineering Software	0	3	1	0	0	25	25	50	
7	65852	Industrial Management	2	0	2	40	60	0	0	100	
Total			11	24	19	220	330	200	200	950	

66461

Advanced Surveying

T P C

2 6 4

AIMS

- To be able to understand Field Astronomy.
- To be able to determine latitude and longitude of a place.
- To be able to learn using digital theodolite and total station.
- To be able to learn global positioning system (GPS).
- To be able to learn Geographic Information Systems(GIS)
- To be able to learn about geodetic control points.
- To be able to understand RTK.

SHORT DESCRIPTION

Field astronomy; Digital Theodolite; Total station; Global positioning system (GPS); Geographic Information Systems (GIS), geodetic control points, RTK.

DETAIL DESCRIPTION

Theory:

1 Understand field astronomy.

1.1 State the astronomical terms: Spherical trigonometry, Small circle, Great circle, Celestial sphere, Zenith, Nadir, Celestial horizon, Visible horizon, Polar equator, Polar axis, Celestial equator, Celestial poles, Prime vertical, Ecliptic, Nautical mile, Altitude and azimuth, Declination and Right ascension, Declination and Hour angle, Culmination, Circumpolar star, Astronomical triangle, Spherical triangle, Spherical excess, Polaris, Meridian, Azimuth, latitude and longitude.

- 1.2 Determine the length of a great circle arc.
- 1.3 Determine the length of a small circle arc.
- 1.4 Mention the properties of a spherical triangle.
- 1.5 State the altitude and azimuth system.
- 1.6 State the declination and hour angle system.
- 1.7 State the declination and right ascension.

2 Understand different types of time.

- 2.1 State the terms: Sidereal time, apparent solar time, Mean solar time, Local time, Local mean time, Greenwich mean time and Standard time.
- 2.2 Describe the equation of time.
- 2.3 Convert standard time to local mean time and vice versa.
- 2.4 Convert local time to Greenwich Mean Time and vice versa.
- 2.5 Solve problem on Conversion of time.

3 Understand the digital theodolite.

- 3.1 Define digital theodolite.
- 3.1 Compare digital theodolite with others.
- 3.3 Describe the components of digital theodolite and its function.
- 3.5 Describe the procedure of setting digital theodolite.
- 3.6 Describe the procedure of measuring horizontal angle with digital theodolite.
- 3.6 Describe the procedure of measuring vertical angle with digital theodolite.
- 3.7 Explain the procedure of measuring magnetic bearing of a line.

4 Understand the principle of operation and uses of total station.

- 4.1 Explain the function of the total station.
- 4.2 State focusing and target point of total station.
- 4.3 Describe the procedural steps of setting total station.
- 4.4 Mention the precaution for using total station.
- 4.5 Mention the procedure of centering and leveling.

5 Understand distance and co-ordinates measurement with total station.

- 5.1 Describe the procedure of EDM setting in the total station.
- 5.2 Describe the procedure of measuring horizontal distance and slop distance with total station.
- 5.3 Describe the procedure of measuring vertical distance with total station.
- 5.5 Explain 3-D co-ordinates.
- 5.6 State the procedure of entering instrument station data.
- 5.6 Mention the procedure of azimuth angle setting.
- 5.7 Describe the procedure of 3-D co-ordinates measurement.

6 Understand resection measurement and setting out measurement.

- 6.5 Explain co-ordinates resection measurement.
- 6.6 Describe height resection measurement.
- 6.7 Explain distance setting out measurement.
- 6.8 Explain co-ordinates setting out measurement.
- 6.9 Describe remote elevation measurement (REM) and setting out measurement.

7 Understand the concept of Geodetic surveying.

- 7.1 Define Geodetic surveying.
- 7.2 Explain the purpose of Geodetic surveying.
- 7.3 Define geodetic control point.
- 7.4 Explain horizontal and vertical control points.
- 7.5 Identify the Standard Geodetic datum in the World.
- 7.6 State GCS (Geographic Coordinate System) .
- 7.7 Define UTM (Universal Transverse Mercator) System.
- 7.8 Using Geographic Tools (Coordinate Conversion / Datum Transformation)
- 7.9 Convert GCS to UTM and vice-versa.
- 7.10 Define BUTM (Bangladesh Universal Transverse Mercator) System.

8 Understand the principles of operation and uses of GPS receiver.

- 8.1 Explain Global Positioning System (GPS).
- 8.2 Describe the working principles of GPS receiver.
- 8.3 Mention different features of GPS receiver.
- 8.4 Describe operational process of the instruments related to GPS.
- 8.5 Describe the procedure of finding co-ordinates of a station using GPS receiver.
- 8.6 List the works performed by GPS receiver.
- 8.7 Mention different types of software used in GPS receiver.
- 8.8 Describe the preparation of a map using mapping software and data received with GPS receiver.
- 8.9 To locate a geodetic position in a project area using GNNS Receiver.

9 Understand the principles of Geographic Information System (GIS)

- 9.1 Explain Geographic Information System (GIS).
- 9.2 Describe advantages of GIS.
- 9.3 Mention Major application of GIS.
- 9.4 Describe Basic functions of GIS.
- 9.5 Explain GIS data model.
- 9.6 Describe different source of geographic data.
- 9.7 Mention different Methods of data capture.
- 9.8 Define Spatial Database
- 9.9 Describe Database management system.

10 Understand the concept of GIS Map.

- 10.1 Mention different types of GIS software.
- 10.2 Describe required hardware and software for GIS.
- 10.3 Install Arc Map software and identify different working tools.
- 10.4 Prepare a Base Map showing all features in standard GIS format.
- 10.5 Prepare a Contour map showing all existing /proposed Infrastructure in GIS Environment.
- 10.6 Prepare a DEM Map showing all existing /proposed Infrastructure in GIS format.
- 10.7 Prepare a KMZ file of all features should be overlaid on Google image.
- 10.8 Collect all views of Picture in existing features in different modes.
- 10.9 Describe the procedure of plotting map in the computer.

11 Understand the concept of Real-Time Kinematic(RTK) Surveying.

- 11.1 Define Real-Time Kinematic(RTK) Surveying.
- 11.2 Mention the objectives of RTK surveying.
- 11.3 Describe advantages of RTK surveying.
- 11.4 Mention the components of RTK system.
- 11.5 Describe the the procedure of setting up a base station.
- 11.6 Describe the procedure of setting up of rover.
- 11.7 Perform GPS survey using RTK system.

Practical:

1. Determine the height and distance of a tower using digital theodolite.
2. Perform temporary and permanent adjustment of total station.
3. Determine height and distance of tower using total station.
4. Determine the width of Road/ River/Lake with total station.
5. Perform co-ordinate setting and back sighting of Total Station of several points.
6. Conduct a Digital Topographic Survey with total station in your own Institution and plot maps including computation of areas.
7. Plot a Topographical survey map with the help of plotter/printer using different scale.
8. Perform layout plan of a high-rise Building including pile, pile cap, grid line, column etc.
9. Measure the latitude and longitude of a place in your Institution using GPS receiver.
10. Observe your speed, distance and time to reach your destination and find the Latitude and longitude of the place.
11. Conduct a geodetic survey using GPS receiver and plot maps including computation of areas.

12. Prepare a Base Map showing all features in standard GIS format.
13. Prepare a Contour map showing all existing /proposed Infrastructure in GIS Environment.
14. Prepare a DEM Map showing all existing /proposed Infrastructure in GIS format.
15. Prepare a KMZ file of all features should be overlaid on Google image.
16. Plot all the views of map in different scale with plotter/ printer.
17. Find out geodetic control points using Google search and show horizontal & vertical control points.
18. To locate a geodetic position in Google Maps and add label of the target places.
19. Transfer a SOB BM using leveling operation in a project area and mark position of T BM on a pillar.
20. Perform GPS survey using RTK system

REFERENCE BOOKS

2. Advance Surveying - Natarajan
3. Surveying (Volume-2) - Dr. B.C. Punmia
4. A Text Book of surveying - Aziz & Shahjahan.
5. A Text Book of surveying (Volume-II) - P.B. Shahani
6. Manual SOKIA total station
7. Murai, S. (1999) GIS work book Japan Association of Surveyors (JAS),
1-3-4 Koishigawa, Bunkyo-Ku, Tokyo 112, Japan
Advance Surveying -by SatheeshGopi, R.Sathikumar, N.Madhu
GPS for land surveyors - by Jan Van Sickle

66462

Transportation Engineering-I

T P C

2 3 3

AIMS

- To be able to understand the standard types of construction used in Bangladesh for road & pavement, bridge & culvert to assess the advantages and disadvantages of each type.
- To be able to understand the procedure, methods & techniques used in Construction of road & pavement, drainage system, bridges & culverts, Embankment & cuttings.
- To be able to understand the importance of traffic control system.
- To be able to understand the maintenance, servicing & repair procedure, methods & techniques used to keep the highway operational.
- To be able to acquaint with the different aspects of airport construction.

SHORT DESCRIPTION

Modes of transportation and history of road development; Highway planning; Road Alignment and survey; Highway geometrics; Sub-grade soil; Highway materials, Construction of road formation & classification of road; Low cost road; Water bound macadam road; Bituminous road; Cement concrete road; Hill road; Highway drainage; Traffic control; Road arboriculture; Highway machinery; Highway failures & maintenance; Highway bridges & culverts; Planning of airport; Geometric standard in airport, airport building & warehouses.

DETAIL DESCRIPTION

Theory:

1. Understand the modes of transportation, concept of highway planning and concept of alignment of road and survey.

- 1.1 Classify transportation.
- 1.2 Explain the importance of transportation.
- 1.3 Mention the benefits of good road system.
- 1.4 Mention the characteristics of important early roads.
- 1.5 Explain the importance of highway planning.
- 1.6 Classify the road according to location & functions; Mention the objectives of road planning & survey.
- 1.7 Define alignment and fundamental principles of alignment of road.
- 1.8 Describe the reconnaissance, preliminary, final location survey and soil survey for a road construction.
- 1.9 Mention the points to be considered in fixing location of a new urban road.

2 Understand the principles of highway geometric, Highway Cross-section and intersections.

- 4.1 Define and classify the highway geometric and the level intersection of roads into broad categories such as:
 - a) Cross-sectional elements (camber, super elevation, Curve, Right of way and Gradient)
 - b) Visibility

- c) Horizontal / Vertical curves
 - d) Road intersections
- 4.2 Define the terms right of way, formation width, side slope, berm, embankment, cutting, shoulder, carriage way width, footpath, cycle track, parking lanes, median strip, kerb, skid, slip and Friction of a Road.
- 4.3 Mention the factors that affect friction coefficient and the highway geometrics.
- 4.4 Explain the necessity of camber, gradient, super elevation and curve.
- 4.5 Describe the procedure of providing camber, gradient, super elevation and curve in road.
- 4.6 Solve the problems on super elevation.
- 4.7 Mention the factors on which the curves and gradient of a road depend.
- 4.8 Mention the purposes of intersection of roads.
- 4.9 Mention the advantages and disadvantages of each type of intersections and Grade separations.
- 4.10 Define underpass and Overpass.

3 Understand the concept of sight distance.

- 3.1 State the reaction time and reaction distance.
- 3.2 State the braking time and braking distance.
- 3.3 Classify the various types of sight distances.
- 3.4 Describe each type of sight distances.
- 3.5 Solve problems on stopping sight distance and passing sight distance.

4 Understand the characteristics of sub-grade soil and materials for highway construction.

- 4.1 Define the term sub-grade in highway.
- 4.2 Describe the characteristics of different sub-grade soil.
- 4.3 Mention the suitable sub-grade for various types of highway construction.
- 4.4 Describe the procedure of improving sub-grade soil for road construction.
- 4.5 Describe construction of road in water logged area.
- 4.6 Mention the advantages and limitations of aggregates for highway construction.
- 4.7 List the tests required for aggregates used for highway construction.
- 4.8 Describe different types of bituminous materials for road construction.
- 4.9 State the properties of bituminous materials.
- 4.10 List the standard tests on bituminous materials.

5 Understand the concept of road formation and classification.

- 5.1 Describe the procedure of earth work in cutting, filling and compaction of soil and turfing used in road embankment.
- 5.2 List the field tests needed to find out the good quality of compaction of soil for road construction.
- 5.3 Classify the road on the basis of materials, volume of traffic, type of traffic, number of lanes, direction of movement of traffic, area they traverse, cost of roads and rigidity of roads.
- 5.4 Classify and describe the various types of low cost roads (earthen, gravel, soil stabilized road)
- 5.5 Define and describe the preparation and construction procedure of WBM, bituminous, CC and RCC road.
- 5.6 Mention the advantages and disadvantages of WBM and Bituminous road.
- 5.7 Define the terms seal coat, tack coat and prime coat, bituminous carpet, bituminous concrete, sheet asphalt and mastic asphalt.
- 5.8 Mention the advantages and disadvantages of bituminous, CC and RCC road.

5.9 List and explain the joints for CC and RCC road with their specification and sketches and describe the functions of joint filers & sealers in CC and reinforcement & dowel bars in RCC road.

5.10 Distinguish between flexible and rigid pavement.

6 Understand the concept of hill road and highway drainage.

6.1 Mention the special points to be considered for alignment of hill road.

6.2 Define the terms: village path or track, bridle path, motor road, hill road, Salient curves, re-entrant curve, hair pin bend, corner bend, trace cut.

6.3 State the meaning of retaining wall and breast wall.

6.4 Mention the causes of land slide and preventive measures of land slide.

6.5 Mention the requirements of highway drainage.

6.6 Mention the factors which control the design of highway drainage system.

6.7 Mention the effects of improper drainage.

6.8 Describe the highway drainage system.

6.9 Classify the highway drainage.

6.10 Define and classify of cross-drainage works.

7 Understand the concept of traffic signs.

7.1 Classify the different types of traffic signs.

7.2 Explain the importance of traffic signs.

7.3 Mention the utility of traffic studies.

7.4 Mention the utility of traffic regulations.

7.5 Mention the utility of traffic signs.

8 Understand the machineries used for construction of roads & highways.

8.1 List the machineries used for cleaning the site, earth cutting, earth removing, Consolidating and grading in highway construction.

8.2 List the machineries used for crushing road metals.

8.3 List the machineries used for construction of bituminous road.

8.4 List the machineries used for construction of CC & RCC road.

9 Understand the causes of failures and maintenance of roads & highways.

9.1 Describe the sub-grade, base and wearing course failures.

9.2 Mention the typical failures of flexible pavement.

9.3 Mention the causes of failures of CC & RCC road.

9.4 Mention the typical failures of CC & RCC road.

9.5 Explain the significance of routine maintenance of highways.

9.6 Classify the maintenance work of road.

9.7 Describe the maintenance of

(a) Earthen road.

(b) Water bound macadam road.

(c) Bituminous road.

(d) CC & RCC road.

9.8 Mention the causes for corrugations and wavy surfaces.

9.9 Mention the remedies for corrugations and wavy surfaces.

10 Understand the highway bridges & culverts.

- 10.1 Distinguish between bridge and culvert.
- 10.2 Mention the ideal site for construction a bridge or culvert in roads & highways.
- 10.3 Classify the different types of bridges and culverts.
- 10.4 Mention the factors which affect the choice & type of bridge or culvert.
- 10.5 Define the terms: flood discharge, waterway, scouring depth, free board in the construction of bridges & culverts.
- 10.6 Explain the necessity of repair and maintenance of bridges & culverts.

11 Understand the concept of planning of airport and the standard of geometrics used in airport.

- 11.1 Mention the information required for planning of an airport.
- 11.2 Mention the points to be considered in selecting the site for an airport.
- 11.3 Describe the terms: landing strip, approach zone, running lengths & hanger.
- 11.4 Classify different types of airport.
- 11.1 Explain the terms: runway, taxiway, aprons, runway orientation, pattern & grade.
- 11.2 Distinguish between runway and taxiway.
- 11.3 State the meaning of heliport.
- 11.4 Mention the functions of terminal building.
- 11.5 Distinguish between heliport and airport.

12 Understand the concept of airport building & warehouse.

- 12.1 Mention the functions of airport building.
- 12.2 Mention the facilities to be provided in airport building.
- 12.3 State the meaning of warehouse.
- 12.4 State the importance of warehouse.

Practical:

1. Setting an alignment of a new road.
2. Prepare the model of a typical clover leaf pattern of grade separation.
3. Perform crushing strength test of coarse aggregate used in road construction.
4. Perform abrasion test of coarse aggregate used in road construction.
5. Perform water absorption, specific gravity and density test of coarse aggregate used in road construction.
6. Perform the California Bearing Ratio (CBR) test.
7. Perform the aggregate impact value test.
8. Perform the test of grading of coarse aggregate.
9. Perform the following test for bitumen.
 - a. Loss of ignition
 - b. Softening point
 - c. Fire point.
 - d. Flash point
 - e. Marshal test
10. Prepare the models of different types of traffic signs.
11. Visit of a Fly Over/Overpass/Underpass/intersection/grade separation.
12. Visit of an International Airport.

REFERENCE BOOKS

1. Highway Engineering -by Gur Charan Singh
2. A text book on Highway Engineering and Airports -by S B Sehgal & K L Bhanot
3. Highway Engineering -by S C Rangwala
4. Highway and Airport Engineering -by V B Priyani

66463

Design Of Structure - I

T P C

2 3 3

AIMS

- To be able to understand the properties of reinforced cement concrete (RCC).
- To be able to select the suitable size of reinforced concrete beams & lintels with reinforcement.
- To be able to supervise the placing of reinforcement for beams & lintel.

SHORT DESCRIPTION

Reinforced cement concrete; Theory of bending; Investigation of beam; Shear stress and bond stress; Design of reinforced cement concrete rectangular beam, T-beam, double reinforced beam and lintel.

DETAIL DESCRIPTION

Theory:

1 Understand the different type of cement concrete and structural safety.

- 1.1 Describe and use of the plain concrete, reinforced concrete and pre-stressed concrete.
- 1.2 Mention the advantages, disadvantages & limitations of the plain Concrete, reinforced concrete and pre-stressed concrete.
- 1.3 Define and calculate young modulus of elasticity of concrete.
- 1.4 Describe test procedure of crushing cubes and cylinders for compression test.
- 1.5 Define Richter scale, tectonic plate and epicenter.
- 1.6 Explain the necessity of considering the seismic load and wind load in designing reinforced concrete works.
- 1.7 Mention the significant of the thrust (like tidal, cyclones etc.) to be consider in designing reinforced concrete structure in coastal zone.
- 1.8 Explain the need for structural safety and safety provision.

2 Understand the properties & behavior of reinforcing steel used in RCC.

- 2.1 List the different types & grades of steel used in RCC and pre-stressed concrete.
- 2.2 Mention the advantages of uses of mild steel in RCC.
- 2.3 Describe the scope of using welded wire fabric in RCC.
- 2.4 Mention the characteristics of plain bar, deformed bar and twisted bar and tendon.
- 2.5 Mention the advantages of uses of deformed and twisted bar in RCC.
- 2.6 State the minimum reinforcement used in RCC beam and slab.

3 Understand the concept of transformed section of beam.

- 3.1 Define transformed section.
- 3.2 Explain the theory of transformed section with sketches.
- 3.3 Express the derivation of the equation for investigating the stresses developed in concrete and steel by transformed section method.
- 3.4 Calculate the stresses developed in rectangular beam and T-beam in WSD method.
- 3.5 Explain balanced reinforced beam, under reinforced beam and over reinforced beam.
- 3.6 Mention the effect of under reinforcement and over reinforcement in RCC beams.

- 4 Understand the shear stress developed in RCC beams.**
- 4.1 Explain the effects of shear force and stress in RCC beams.
 - 4.2 State the meaning of diagonal tension.
 - 4.3 Explain the causes of creating diagonal tension in RCC beams.
 - 4.4 Express the derivation of the formula to determine shear stress developed in RCC beams.
 - 4.5 Solve the problems on shear stress developed in WSD method.
 - 4.6 Solve the problems on shear stress developed in USD method.
 - 4.7 Mention the allowable shear stress for RCC beam (v) and shear stress for concrete (v_c).
- 5 Understand the functions of web reinforcement in RCC beams.**
- 5.1 Define web reinforcement.
 - 5.2 Classify web reinforcement with sketches.
 - 5.3 Mention the functions of web reinforcement in RCC beams.
 - 5.4 Determine the spacing of web reinforcement (vertical & inclined) in WSD method.
 - 5.5 Determine the spacing of web reinforcement in USD method.
 - 5.6 Determine the portion of the RCC beam requiring web reinforcement.
- 6 Understand the bond stress developed in RCC beams.**
- 6.1 State the meaning of bond stress.
 - 6.2 Express the derivation of the formula to determine bond stress developed in RCC beams.
 - 6.3 State the allowable bond stress for plain bar and deformed bar in WSD and USD methods.
 - 6.4 Determine the anchorage length of reinforcement in RCC.
 - 6.5 Explain the necessity of standard hooks of reinforcement in RCC.
- 7 Understand the flexure formula and design of RCC rectangular beam in WSD method.**
- 7.1 State the assumptions used in developing the flexure formula.
 - 7.2 Explain the stress diagram of a loaded RCC beam.
 - 7.3 Mention the notations used in flexure formula in WSD method.
 - 7.4 Express the derivation of the flexure formula for RCC beam in WSD method.
 - 7.5 Outline the design steps of RCC rectangular beam in WSD method.
 - 7.6 State the minimum spacing of reinforcing bars in RCC beam.
 - 7.7 Design a simply supported RCC rectangular beam in WSD method.
 - 7.8 Design a semi-continuous RCC rectangular beam in WSD method.
 - 7.9 Design a continuous RCC rectangular beam in WSD method.
- 8 Understand flexure formula and design of RCC rectangular beam in USD method.**
- 8.1 Differentiate WSD and USD method.
 - 8.2 Explain the stress diagram of loaded beam with showing the actual & equivalent rectangular stress distribution of ultimate load.
 - 8.3 State the load and load factors used in USD method.
 - 8.4 Mention the notations used in flexure formula in USD method.
 - 8.5 Express the derivation of the flexure formula in USD method.
 - 8.6 Outline the design steps of RCC rectangular beam in USD method.
 - 8.7 Design a simply supported RCC rectangular beam in USD method.
 - 8.8 Design a semi-continuous RCC rectangular beam in USD method.
 - 8.9 Design a continuous RCC rectangular beam in USD method.

9 Understand the design of RCC cantilever & overhanging rectangular beams in WSD method.

- 9.1 Determine the design load, shear force and bending moment of RCC cantilever & overhanging beams.
- 9.2 Design a cantilever RCC rectangular beam.
- 9.3 Design an overhanging RCC rectangular beam.
- 9.4 Describe the technique of curtailment of reinforcement in cantilever RCC beams.

10 Understand the T-beam and design of RCC T-beams

- 10.1 Define T-beam.
- 10.2 Identify the different parts of a typical T-beam.
- 10.3 Determine the width of flange of T-beam considering span length and slab thickness.
- 10.4 State the ratio of width of web to the depth of web for T-beams.
- 10.5 Distinguish between RCC rectangular beam and T-beam.
- 10.6 Determine the depth and width of a simply supported T-beam in respect to shear force.
- 10.7 Outline the design steps of RCC T-beam in WSD method.
- 10.8 Design a simply supported RCC T-beam in WSD method.
- 10.9 Design a semi-continuous RCC T-beam in WSD method.
- 10.10 Design a continuous RCC T-beam in WSD method.

11 Understand the design of RCC beam with compression reinforcement.

- 11.1 State the meaning of double reinforced beam.
- 11.2 Differentiate between RCC single and double reinforced beam.
- 11.3 Outline the design steps of double reinforced beam.
- 11.4 Design a simply supported double reinforced beam.
- 11.5 Design a semi-continuous double reinforced beam.
- 11.6 Design a continuous double reinforced beam.

12 Understand the design of RCC lintel over doors & windows.

- 12.1 Determine the area of the wall to be considered in determining the design load for RCC lintels.
- 12.2 Outline the design steps of RCC lintel.
- 12.3 Design a RCC lintel over doors and windows.

Practical:

- 1. Perform compression test of concrete cylinder for particular proportion with different water-cement ratio.
- 2. Perform compression test of concrete cube for particular proportion with different water-cement ratio
- 3. Conduct tensile strength test of mild steel for plain bar of different diameters.
- 4. Conduct tensile strength test of mild steel for deformed bar of different diameters.
- 5. Prepare a model of simply supported RCC rectangular beam as per drawing.
- 6. Prepare a model of semi-continuous RCC rectangular beam as per drawing.
- 7. Prepare a model of continuous RCC rectangular beam as per drawing.
- 8. Prepare a model of double reinforced simply supported rectangular beam as per drawing.
- 9. Prepare a model of RCC lintel as per drawing.
- 10. Prepare a model of RCC lintel with sunshade as per drawing.

REFERENCE BOOKS

1. Simplified Design of Reinforced Concrete
-by H Parker
2. Design of Concrete Structures
-by G Winter, L C Urquhart, C E O'Rourke, A H Nilson
3. Treasure of R C C Designs
-by Sushil Kumar
4. R C C Design -by Abul Faraz Khan

66464

Civil Engineering Drawing-3 (CAD)

T P C

1 6 3

AIMS

To be able to develop knowledge, skill and attitude in the field of Civil Engineering Drawing with special emphasis on:

- Building Plan,
- detail drawing of staircase, Kitchen, Toilet
- Plumbing drawing, Electrical drawing,
- working drawing with Auto CAD
- Building Approval Sheet.
- Rendering ,
- Layout and Plotting.

SHORT DESCRIPTION

Plan of Residential building, Kitchen and Toilet details, Plumbing drawing, Electrical drawing, Culvert, T-Beam, 3D object, Details of door and window, Plotting, Rendering with Auto CAD.

DETAIL DESCRIPTION

Theory:

1. Understand the Auto CAD environments.

- 1.1 Explain How to starts Auto CAD software and identify the different areas of CAD graphic screen.
- 1.2 Describe the use menu bar, command window and toolbar.
- 1.3 Express the Cartesian co-ordinate system.
- 1.4 Explain how to save the drawing & exit from the file.

2. Understand the functions and uses of different CAD commands.

- 2.1 State the meaning of WCS icon and UCS icon.
- 2.2 Mention the classifications of co-ordinate system.
- 2.3 State the necessity of drawing units and limits.
- 2.4 Mention the functions of the following editing commands: copy, move, array, offset, trim, fillet, chamfer, extend, break, rotate, stretch, mirror, change, chprop, scale and pedit.
- 2.5 Mention the functions of the following object grouping commands: block, insert, explode, w block, divide, measure, purge, xref etc.
- 2.6 Mention the functions of the following enquiry commands: dist, area, Id, list etc.
- 2.7 Mention the functions of the following plotting commands: layout, view port, model space, paper space.
- 2.8 Mention the functions of the following dimension commands: dimension style, Ddim, leader, linear dimension, radius & diameter dimension, aligned dimension, continue dimension, base dimension etc.
- 2.9 Mention the functions of the following geometric commands: donut, solid, trace, pline, xline, ray, fill, hatch and text etc.
- 2.10 State the functions of Auto CAD design center (ADC).

3. Understand the preparation of plan, section, elevation and other components of multi-storied framed structure building using CAD.

- 3.1 Describe the process of drawing the site plan and layout plan of a multistoried framed structure building.
- 3.2 Describe the process of drawing the plan, elevation and sectional elevation of a multi-storied framed structure building.
- 3.3 Describe the process of making the detailed drawing of beam, roof slab and lintel of multi-storied building.
- 3.4 Describe the process of making the detailed drawing of staircase, lift core and ramp of multi-storied building.
- 3.5 Mention the advantages of making the necessary drawings of multistoried framed structure building using CAD.

4. Understand the drawing about 3D using Auto CAD.

- 4.1 Explain about starting 3D.
- 4.2 Explain how to create 3D objects / model.
- 4.3 Explain how to draw isometric view.
- 4.4 Explain about Edgesurf, Rulesurf, Tabsurf & Mesh.
- 4.5 Explain the uses of Co-ordinate system in Auto CAD.
- 4.6 Explain how to create surface modeling.
- 4.7 Explain the use of 3D editing commands.

5. Understand the perspective view with rendering lighting & imaging in Auto CAD.

- 5.1 Explain how to creating perspective view.
- 5.2 Describe the use of distance and camera in perspective view.
- 5.3 Describe the rendering and materials effect in 3D.
- 5.4 Describe the uses & set up of background in 3D.
- 5.5 Describe the lighting & shadow in 3D.
- 5.6 Describe the uses of showing images in 3D.
- 5.7 Explain how to print 3D view.

6 Understand the Layout and plot the drawing.

- 6.1 Define layout for plot/print using paper space and model space.
- 6.2 State the scale & assign pen (if necessary) for plot/print.
- 6.3 Describe the paper & plotter for plotting/printing.
- 6.4 Describe the process of Plot/Print the drawing.
- 6.5 Discuss about various drawing in different scale in a paper through layout.
- 6.6 Describe the process of drawing in PDF format.

Practical:

1. Set up the drawing environments.

- 1.1 Start CAD software and identify the different areas of CAD graphic screen.
- 1.2 Use menu bar, command window and toolbar.
- 1.3 Perform the Cartesian co-ordinate system.
- 1.4 Save the drawing & exit from the file.

2. Construct the floor plan of a single unit residential flat(120 sqm).

- 2.1. Draw the floor plan in 1:50 scale of a 3- bedroom house.
- 2.2. Show the inside and outside detail dimension in the drawn plan (1.1).
- 2.3. Draw Front and side elevation (minimum one) in 1:50 scale of the 2- bedroom house
- 2.4. Draw section in 1:50 scale of the 3- bedroom house showing all dimension and material symbol.
- 2.5. Draw dining, drawing, kitchen, toilet etc. using above scale.
- 2.6. Make a finish schedule of the residence.

3. Construct the detail drawing of a Staircase.

- 3.1. Draw the detail ground floor plan of a doglegged staircase in 1:50 scale.
- 3.2. Draw the detail typical floor plan of a doglegged staircase in 1:50 scale.
- 3.3. Draw the section of the doglegged staircase in 1:50 scale with dimension.
- 3.4. Draw the detail of steps, nosing, handrail etc. of the staircase.
- 3.5. Draw the detail plan & section of a three quarter stair in 1:50 scale with dimension.

4. Construct the detail drawing of a Kitchen.

- 4.1. Draw the kitchen plan in 1:20 scale of the 3- bedroom house (1.1).
- 4.2. Draw the kitchen fixtures in 1:20 scale on the drawn plan (3.1).
- 4.3. Draw two detail section of the kitchen through sink & burner/range in 1:20 scale showing all dimension.
- 4.4. Draw the cabinet detail showing all dimensions.

5. Construct the detail drawing of a Toilet.

- 5.1. Draw a master bath plan in 1:20 scale showing fixtures (Cabinet Basin, Bathtub, W.C. etc.) with all dimensions.
- 5.2. Draw the detail section of the master bath in 1:20 scale showing maximum fixtures and all dimensions.
- 5.3. Draw the toilet/bath plan in 1:20 scale showing fixtures (Basin, Shower tray, Long Pan/Indian Pan etc.) with all dimensions.
- 5.4. Draw the detail section of the toilet in 1:20 scale showing maximum fixtures and all dimensions.

6. Prepare various type of water supply fittings and fixtures.

- 6.1. Draw the various diameter water supply pipe.
- 6.2. Draw various diameter pipes for drainage water.
- 6.3. Draw various types of fittings using water supply and sanitation.
- 6.4. Draw various types of fixtures using water supply and sanitation.

7. Prepare a complete plumbing drawing by using Auto CAD.

- 7.1. Draw water supply and sewage pipe line as per layout.
- 7.2. Draw the plumbing fixtures & fittings on the floor plan.
- 7.3. Make a legend of electrical fixture & fittings.

8. Prepare the electrical drawing set with Auto CAD.

- 8.1. Make a layer for electrical layout of floor plan.
- 8.2. Draw the electrical fixtures & fittings on the floor plan.
- 8.3. Make a layer for electrical layout of floor plan.
- 8.4. Draw the electrical fixtures & fittings on the floor plan.
- 8.5. Make a legend of electrical fixture & fittings.
- 8.6. Draw circuit diagram of the floor plan.

9. Prepare detailed drawing of two span box culvert using CAD.

- 9.1. Draw the sectional plan of a two span RCC box culvert.
- 9.2. Draw the cross section of a two span RCC box culvert.
- 9.3. Draw the long section of a two span RCC box culvert.
- 9.4. Show the long section arrangement in the decking of the two spans RCC box culvert.

10. Prepare detailed drawing of T-beam decking bridge using CAD.

- 10.1 Draw a half top plan and half plan (decking and earth removed) of RCC T-beam decking bridge with splayed type wing wall.
- 10.2 Draw a sectional elevation of RCC T-beam decking bridge.
- 10.3 Draw the cross section of RCC T-beam decking bridge showing the reinforcement.
- 10.4 Show the details of T-beam of RCC T-beam bridge.
- 10.5 Show the details of wing wall, turn wall, railing and bed block of RCC T-beam bridge.

11. Prepare the drawing with steel truss using CAD.

- 11.1 Draw a drawing of steel truss for factory.
- 11.2 Draw a drawing of steel truss with simple building.

12. Prepare the 3D objects using CAD.

- 12.1 Create simple 3D object in auto CAD.
- 12.2 Draw isometric view.
- 12.3 Create 3D surface by using 3D poly, Edge surf, Rule surf, Tab surf & Mesh.
- 12.4 Edit / draw 3D object using polar co-ordinate system.
- 12.5 Edit 3D object using different editing command i. e. align, 3D rotate, 3Darray 3D, mirror, 3D, move, chamfer, fillet, trim etc.

13. Modify/Edit the 3D objects using CAD.

- 13.1 Create 3D surface/object by using extrude.
- 13.2 Edit 3d object using union command
- 13.3 Draw 3d object using revolves command.
- 13.4 Edit / draw 3D object using intersect command.
- 13.5 Edit 3D object using subtracts command.

14. Prepare working drawing of paneled & flush door.

- 14.1 Draw the plan of wooden paneled door in scale 1:20
- 14.2 Draw the elevation & section of paneled door in scale 1:20
- 14.3 Draw the plan of wooden flush door in scale 1:20
- 14.4 Draw the elevation & section of flush door in scale 1:20
- 14.5 Draw the plan of wooden glazed door in scale 1:20
- 14.6 Draw the elevation & section of glazed door in scale 1:20

15. Prepare detail drawing of wooden door.

- 15.1 Draw detail section of wooden frame/chowkat in scale 1:20
- 15.2 Draw detail section of wooden paneled door and shutter in scale 1:20
- 15.3 Draw detail of flush door in scale 1:20
- 15.4 Draw detail of glazed door in scale 1:20

16. Prepare working drawing of Aluminum sliding door.

- 16.1 Draw the plan of Aluminum sliding door in scale 1:20
- 16.2 Draw the elevation & section of Aluminum sliding door in scale 1:20
- 16.3 Draw the plan of Aluminum swing door in scale 1:20
- 16.4 Draw the elevation & section Aluminum swing door in scale 1:20

17. Prepare working drawing of wooden window.

- 17.1 Draw the plan of wooden glazed window (scale 1:20)
- 17.2 Draw the elevation & section of wooden glazed window (scale 1:20)
- 17.3 Draw the plan of steel glazed window (scale 1:20)
- 17.4 Draw the elevation & section of steel window (scale 1:20)
- 17.5 Draw plan & elevation of pivoted window (scale 1:20)

18. Set the Layout and plot the drawing.

- 18.1 Create layout for plot/print using paper space and model space.
- 18.2 Set up the scale & assign pen (if necessary) for plot/print.
- 18.3 Select the paper & plotter for plotting/printing.
- 18.4 Plot/Print the drawing.
- 18.5 Set various drawing in different scale in a paper through layout.
- 18.6 Save the drawing in PDF format.

19. Perform the preparation of the perspective view with rendering lighting & imaging in Auto CAD.

- 19.1 Set the distance create perspective view.
- 19.2 Set the camera to draw the perspective view.
- 19.3 Draw perspective view of an object using 3D view command.
- 19.4 Set the material from material library for rendering.
- 19.5 Set the background color / image for rendering.
- 19.6 Set the light & create shadow using different command.
- 19.7 Draw perspective view of an object with full rendering.

20. Prepare a building model by using 3D.

- 20.1 Fix up the door & window in the model
- 20.2 Add roof slab over the wall
- 20.3 Fix up all necessary elements of mode
- 20.3 Beautification the model
- 20.5 Run the model

REFERENCE BOOKS:

1. Internet source
2. Working Drawing - I – BTEB
3. Time Saver Standard- Building Type
4. Auto CAD - Samuel A Mallick
Engr. Md. Shah Alam

66465

Foundation Engineering

T P C

2 3 3

AIMS

- To be able to understand the foundation and foundation engineering.
- To be able to understand the soil stabilization.
- To be able to understand and the bearing capacity of soil.
- To be able to understand the factors determining types of foundation.
- To be able to understand the foundation on sand and non-plastic soil, plastic soil, non-uniform soil, rock.
- To be able to understand the excavating and bracing.
- To be able to understand the sheet pile wall, cofferdam and bulk head.
- To be able to understand the damages due to construction operations.

SHORT DESCRIPTION

Foundation and foundation engineering; Factors determining the types of foundation; Soil stabilization; Bearing capacity of soil; Foundation on sand and non-plastic silt; Foundation on clay and plastic silt; Foundation on non-uniform soil; Foundation on rock; Excavation and bracing; Sheet pile, cofferdam & bulkhead; Damages due to construction operations.

DETAIL DESCRIPTION

Theory:

1 Understand the foundation, foundation engineering and the factors determining types of foundation.

- 1.1 State the meaning of foundation and foundation engineering.
- 1.2 Mention the requirements of a satisfactory foundation.
- 1.3 Mention the classification of foundation.
- 1.4 Mention the factors governing the depth of foundation.
- 1.5 Explain the steps in choosing types of foundation.
- 1.6 Discuss the necessity of bearing capacity and settlement in choosing types of foundation.
- 1.7 Describe the design loads as the factors in choosing types of foundation.

2 Understand the soil stabilization.

- 2.1 State the meaning of soil stabilization.
- 2.2 Mention the various methods of soil stabilization.
- 2.3 Describe the process of addition and removal of soil particles for soil stabilization.
- 2.4 Describe the soil stabilization by drainage.
- 2.5 Describe the process of sand piling.
- 2.6 Describe the process of soil cement stabilization.

3 Understand the bearing capacity of soil.

- 3.1 Define the bearing capacity and ultimate bearing capacity of soil.
- 3.2 Mention the Tarzaghi's bearing capacity factors.
- 3.3 Express the equations for determination of ultimate bearing capacity of soil for square and circular footing.

- 3.4 Calculate the ultimate bearing capacity of sandy soil.
- 3.5 Explain the allowable bearing capacity of clay.
- 3.6 Explain the allowable bearing capacity of sand.
- 3.7 Describe the method of plate bearing test.
- 3.8 Calculate the allowable bearing capacity of soil.
- 3.9 Explain the methods for improving bearing capacity of soil.

4 Understand the pile.

- 4.1 Define and classify pile.
- 4.2 Differentiate precast & cast in situ pile.
- 4.3 Describe methods of cast in situ and precast pile.
- 4.4 Explain the bearing capacity of pile.
- 4.5 Explain End bearing and skin friction pile.
- 4.6 Describe the skin friction and negative skin friction.
- 4.7 State the meaning of end bearing pile.
- 4.8 Solve the problems for Precast and Cast in situ pile.

5 Understand anchors.

- 5.1 Define the ground anchors.
- 5.2 Describe the anchor in sand.
- 5.3 Describe the anchor in stiff clay.
- 5.4 State the advantage of anchoring.

6 Understand the foundation on sand and non-plastic silt.

- 6.1 Mention the characteristics of sand and silt deposits.
- 6.2 Explain footing on sand.
- 6.3 Explain raft on sand.
- 6.4 Describe the process of excavation in sand.
- 6.5 Explain piles in sand.
- 6.6 Explain piers on sand.

7 Understand the foundation on clay and plastic silt.

- 7.1 Mention the characteristics of clay and plastic silt deposits.
- 7.2 Explain footing on clay.
- 7.3 Explain raft on clay.
- 7.4 Describe the process of excavation in clay.
- 7.5 Explain piles in clay.
- 7.6 State piers on clay.
- 7.7 Explain settlement of foundations underlying by clay.

8 Understand the foundation on non-uniform soils.

- 8.1 Define the non-uniform soils.
- 8.2 Describe the characteristics of soft or loose strata overlaying firm deposit.
- 8.3 Explain the dense or stiff layer overlaying soft deposit as foundation material.
- 8.4 Describe the characteristics of alternating soft and stiff layers.
- 8.5 Describe the characteristics of irregular deposit.

- 8.6 Describe the excavation in non-uniform soils.
- 8.7 Describe the stability of slope in non uniform soils.

9 Understand the foundation on rock.

- 9.1 State the basis for design of foundation on rock.
- 9.2 Explain foundation on un-weathered rock.
- 9.3 Explain foundation on weathered rock.
- 9.4 State the treatment of rock defects.
- 9.5 Describe the process of excavation in rock.

10 Understand the excavating and bracing.

- 10.1 State open excavation with unsupported slope.
- 10.2 Mention the necessity of sheeting and bracing.
- 10.3 Describe sheeting and bracing for shallow excavation.
- 10.4 Describe sheeting and bracing for deep excavation.

11 Understand the sheet pile, cofferdam and bulkhead.

- 11.1 State the meaning of sheet pile, coffer dam and bulk head.
- 11.2 Mention the different types of sheet pile and bulkhead with sketches.
- 11.3 State the forces action on a bulkhead.
- 11.4 Determine the embedded length of cantilever sheet pile in cohesive soil.
- 11.5 Determine the embedded length of cantilever sheet pile in non-cohesive soil.
- 11.6 Design an anchored bulkhead using free earth support method for:
 - a. Granular soil.
 - b. Cohesive soil below dredge line.
- 11.7 Solve problems relating cantilever sheet pile and anchored bulkhead.

12 Understand the damages due to construction operations.

- 12.1 State the settlement due to excavation.
- 12.2 State the settlement due to vibration.
- 12.3 Describe the settlement due to lowering the water table.
- 12.4 State the displacement due to pile driving.

Practical:

- 1 Perform the stabilization of soil by cement-sand method.
- 2 Perform the stabilization of soil by sand pile method.
- 3 Determine the bearing capacity of a test pile.
- 4 Prepare a model of pile foundation.
- 5 Prepare a model of raft foundation.
- 6 Prepare a model of pier foundation.
- 7 Perform the Standard Penetration Test (SPT).
- 8 Calculate load bearing capacity of precast pile
- 9 Calculate load bearing capacity of cast in situ pile.
- 10 Perform field test of bearing capacity of soil as per manual.
- 11 Field visit.

REFERENCE BOOKS

- 1 Foundation Engineering
 - Peck and Henson
- 2 Soil Mechanics & Foundation
 - B.C Punmia
- 2 Foundation Engineering
 - Leonard
- 3 Soil Mechanics
 - Craig
- 4 Building Construction
 - S.C Rangwala
- 5 LGED Manual for soil investigation

66466

Civil Engineering Software

T P C
0 3 1

AIMS:

To be able to develop knowledge and skills in the field of Civil Engineering Software like STAAD Pro, ETABS, GRASP, SAP, RSEPS with Special emphasis on:

- Structural analysis by using various types of software.
- Draw the SFD & BMD by using the software.
- Perform truss analysis by using the software.
- Different set up of estimation software.
- Different command of Software.
- Modification & editing of Software.
- Develop skills in Estimation Software.
- Run the software.
- Printing the output of software.

Short Description:

Different set-up of software; Software operating commands; Modification & edits of software; Run the software; Printing the output of software.

Practical:

1 Model Generation

- 1.1 The Start Page
- 1.2 Starting a New Project
- 1.3 Job Setup
- 1.4 Entering Structural Elements
- 1.5 Working with Grids
- 1.6 Entering Structure Geometry
- 1.7 Editing Structure Geometry
- 1.8 Viewing Structure Geometry

2 Property Assignment

- 2.1 Design Model Geometry
- 2.2 Working with Groups
- 2.3 Assigning Member Properties
- 2.4 Assigning Member Specifications
- 2.5 Assigning Supports
- 2.6 Assigning Loads

3 Analyzing the Model

- 3.1 Preparing for the Analysis
- 3.2 Performing the Analysis
- 3.3 Viewing the Output File

4 The Post Processor

- 4.1 Introduction to the Post Processor
- 4.2 Activating the Post Processor and displaying the Displacement Diagram
- 4.3 Displacement and Reactions Tables and Verifying the Results
- 4.4 Viewing Results
- 4.5 Using Structural Tool Tips to View Results
- 4.6 Labeling the Structure Diagram
- 4.7 Plotting Output

8 Estimation for Road works

- 8.1 Box Cutting
- 8.2 Improved sub grade
- 8.3 Sub Base Course
- 8.4 End Edging
- 8.5 Base Course
- 8.6 Surfacing works
- 8.7 Concrete pavement
- 8.8 HBB road
- 8.9 CC block road
- 8.10 Road maintenance & protective works

9 Estimation for Bridge works

- 9.1 temporary bamboo/wooden bridge and diversion road
- 9.2 Bailey bridge, steel bridge.
- 9.3 Excavation, dewatering, artificial island, cofferdam
- 9.4 Sand filling, brick soling, plain cement concrete, brick work, plaster.

10 Estimation for Foundation works

- 10.1 pile work
- 10.2 well foundation
- 10.3 MS fabrication, re-bar coupler
- 10.5 Repair & rehabilitation works

65852

INDUSTRIAL MANAGEMENT

T P C

2 0 2

AIMS

- To be able to develop the working condition in the field of industrial or other organization.
- To be able to understand develop the labor management relation in the industrial sector.
- To be able to develop the management techniques in the process of decision making.
- To be able to manage the problems created by trade union.
- To be able to understand Planning
- To be able to perform the marketing.
- To be able to maintain inventory.

Course Outline

Basic concepts of management; Principles of management; Planning, Organization, Scientific management; Span of supervision; Motivation; Personnel management and human relation; Staffing and manpower planning ; Training of staff; Concept of leadership; Concepts and techniques of decision making; Concept of trade union; Inventory control; Economic lot size ; Break even analysis; Trade Union and industrial dispute, Marketing;

1 Basic concepts & principles of management.

- 1.1 Define management and industrial management.
- 1.2 State the objectives of modern management.
- 1.3 Describe the scope and functions of management.
- 1.4 State the principles of management.
- 1.5 State the activity level of industrial management from top personnel to workmen.
- 1.6 Describe the relation among administration, organization & management.

2. Concept of Planning

- 2.1 Define Planning
- 2.2 Discuss the importance of Planning
- 2.3 Discuss the Types of Planning.
- 2.4 Discuss the steps in Planning

3 . Concepts of organization and organization structure.

- 3.1 Define management organization.
- 3.2 State the elements of management organization.
- 3.3 Describe different forms of organization structure.
- 3.4 Distinguish between line organization and line & staff organization.
- 3.5 Distinguish between line organization and functional organization.
- 3.6 Describe the features, advantages and disadvantages of different organization structure.

4. Concept of scientific management.

- 4.1 Define scientific management.
- 4.2 Discuss the basic principles of scientific management.
- 4.3 Explain the different aspects of scientific management.
- 4.4 Discuss the advantages and disadvantages of scientific management.
- 4.5 Describe the difference between scientific management and traditional management..

5. Concept of span of supervision.

- 5.1 Define span of supervision and optimum span of supervision.
- 5.2 Discuss the considering factors of optimum span of supervision.
- 5.3 Discuss advantages and disadvantages of optimum span of supervision.
- 5.4 Define delegation of authority.
- 5.5 Explain the principles of delegation of authority.
- 5.6 Explain the terms: authority, responsibility and duties.

6 . Concept of motivation.

- 6.1 Define motivation.
- 6.2 Discuss the importance of motivation.

6.3 Describe financial and non-financial factors of motivation.

6.4 Special Motivational Techniques.

6.5 Discuss the motivation theory of Maslow and Harzberg.

6.6 Differentiate between theory-X and theory-Y.

7. Concept of leadership.

7.1 Define leadership.

7.2 Discuss the importance and necessity of leadership.

7.3 Discuss the functions of leadership.

7.4 Describe the qualities of a leader.

8. Basic concepts and techniques of decision making.

8.1 Define decision making.

8.2 Discuss the importance and necessity of decision making.

8.3 Discuss different types of decision making .

8.4 Describe the steps in decision making.

9 .Concept of personnel management and human relation.

.9.1 Define personnel management.

.9.2 Discuss the functions of personnel management.

9.3 Define staffing.

9.4 Define recruitment and selection of employees.

9.5 Describe various sources of recruitment of employees.

9.6 Describe the methods of selection of employees.

9.7 Define training and orientation of employee.

9.8 Discuss the importance and necessity of training.

9.9 Discuss the various methods of training of workmen, technicians and executive personnel.

10. Concept of inventory control & Economic lot size

10.1 Define inventory.& inventory control.

10.2 Describe the function of inventory control.

10.3 Define Economic lot size and the Method of determination of economic lot size.

10.4 Discuss the effects of over supply and under supply.

10.5 Explain the following terms :

- Bin card or Bin tag.
- Purchase requisition.
- Store requisition.
- Material transfer note.
- First in first out (FIFO).
- Last in first out(LIFO).
- Safety stock
- Lead time

11. Concept of Break Even Point(BEP)

11.1 Define Break Even Point and Break Even Chart.

11.2 Describe the method of determination of BEP

11.3 Explain the terms :

- Break even analysis.
- Fixed cost.
- Variable cost

12 . Concept of Marketing

12.1 Define marketing.

12.2 Discuss the function of marketing.

12.3 State the objectives of marketing.

12.4 Explain the terms :

- Purchase
- Brand
- Producer
- Consumer
- Customer
- Copyright
- Trade mark

12.5 Discuss product life -cycle and marketing strategies in different stages of a product life-cycle

13. Concept of trade union and industrial dispute

- 13.1 Define trade union.
- 13.2 Mention the objectives of trade union.
- 13.3 Discuss the function of trade union.
- 13.4 Describe different types of trade union.
- 13.5 Define industrial dispute
- 13.6 Discuss different type of industrial dispute

REFERENCE BOOKS

- 1. Dr. Md. Mainul Islam and Dr. Abdul Awal Khan-Principles of Management, Bangladesh Open University.
- 2. Mohammad Mohiuddin-Personnel Management and Industrial Relation, NIDS Publication Co. Dhaka.
- 3. সুফিয়া বেগম, মো: জাহেদুল হক ও সুপ্রিয়া ভট্টাচার্য-ব্যবস্থাপনা এর মৌলিক ধারণা,ব্যতিক্রম প্রকাশনী ঢাকা।Matz Usry-Cost Accounting: Planning & Control.



BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207

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

CIVIL TECHNOLOGY
TECHNOLOGY CODE: **664**

7th SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

CIVIL TECHNOLOGY (664)

7th SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total	
						Theory		Practical			
						Cont. assess	Final exam	Cont. assess	Final exam		
1	66471	Civil Engineering Project	0	6	2	0	0	50	50	100	
2	66472	Sanitary Engineering	2	3	3	40	60	25	25	150	
3	66473	Transportation Engineering -2	2	3	3	40	60	25	25	150	
4	66474	Design Of Structure -2	2	3	3	40	60	25	25	150	
5	66475	Water Resources Engineering	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	0	0	100	
		Total	12	21	19	240	360	175	175	950	

66471

Civil Engineering Project

T	P	C
0	6	2

AIMS

- To be able to understand the civil engineering project.
- To be able to develop skill for preparation of different features of civil engineering project.
- To be able to gather experience of preparation of project report on building, foundation and sub-soil investigation.
- To be able to develop skill for interpretation of test result, Steel truss, highway/railway /Flyover/Overpass/underpass/Interchange/Intersection/irrigation and environmental impact analysis.

SHORT DESCRIPTION

Study and report on in respect of multi-storied building; Foundation design; Steel Truss; Highway project; Railway project; Flyover; Overpass; Underpass; Interchange; Intersection; Irrigation canal; Drainage canal; Water supply and sanitation project; Initial Environmental examination (IEE) of a project or any other similar project work as decided by the Head of the Department (HOD) and concern guide teachers.

DETAIL DESCRIPTION

Practical

1. Project on a multi-storied building.

- 1.1 Select a line plan of a multi-storied (residential or commercial) building.
- 1.2 Draw the site plan and layout plan of the building.
- 1.3 Draw the plan, elevation and sections of the building.
- 1.4 Design different parts and members of the building.
- 1.5 Prepare the detailed structural drawing of the building.
- 1.6 Estimate the quantities of different items of civil work of a building including water supply & sanitary works and internal electrification works.
- 1.7 Prepare a schedule of quantities with specifications and the estimate of building.
- 1.8 Prepare an abstract of cost from the estimate.
- 1.9 Prepare and submit a final report for the project.

2. Project on design of foundation of a building.

Select a 6-storied residential building the foundation of which is to be designed. Perform a reconnaissance survey at the proposed building site.

- 2.1 Collect soil samples from the building site.
- 2.2 Perform different tests for the soil samples.
- 2.3 Summarize the test results.
- 2.4 Interpret the test results.
- 2.5 Select two alternatives of foundation for the building.
- 2.6 Design the alternative foundations for the building.
- 2.7 Estimate the foundation cost for two alternatives.
- 2.8 Compare and decide which foundation is better for the building.
- 2.9 Prepare and submit a final report for the project.

3. Project on Steel Truss.

- 3.1 Select and draw a workshop/warehouse showing the position of trusses.

- 3.2 List and sketch different types of steel truss suitable for the said workshop/ warehouse.
 - 3.3 Calculate the load to be carried by the trusses.
 - 3.4 Determine the stress of different members of the trusses.
 - 3.5 Design different members of the trusses.
 - 3.6 Design gusset plates and rivet of the trusses.
 - 4.7 Estimate the quantity of materials required for the trusses and 2 coats of painting over a coat of priming.
 - 4.8 Prepare a schedule of quantities with specifications of the items of works.
 - 4.9 Prepare an abstract of cost from the estimate of the trusses.
 - 4.10 Prepare and submit a final report for the project.
- 4. Project on water supply and sanitary works.**
 - 4.1 Select a suitable site for the project (may be institute campus).
 - 4.2 Draw the site plan of the project area showing different buildings.
 - 4.3 Calculate the water demand and quantity of sanitary disposal from the site.
 - 4.4 Calculate the capacity of underground / overhead reservoir and septic tank required.
 - 4.5 Sketch the water supply and sanitary network for the project.
 - 4.6 Estimate the quantities of different items of works for water supply and sanitary works.
 - 4.7 Prepare a schedule of quantities with specifications of the items of water supply and sanitary work.
 - 4.8 Prepare an abstract of cost from the estimate of the project.
 - 4.9 Prepare and submit a final report for the project.
 - 5. Project on Highway/Railway/Flyover/Elevated Express Way/Metro Rail/Underpass/ Overpass/ Interchange/Intersection/Irrigation canal/Drainage canal.**
 - 5.1 Select the type and location of the project.
 - 5.2 Make reconnaissance survey and preliminary survey of the project.
 - 5.3 Plot the area of the project.
 - 5.4 Draw the detailed drawing of the project.
 - 5.5 Estimate the different items of works.
 - 5.6 Prepare and submit a final report for the project
 - 6. Project on digital survey by using total station for specific area.**
 - 6.1 Leveling the Total Station
 - 6.2 Tripod Setup and Mount Instrument on Tripod
 - 6.3 Focus on Survey Point
 - 6.4 Leveling the Instrument
 - 6.5 Electronically Verify Leveling
 - 6.6 Adjust Image & Reticle Focus
 - 6.7 Measuring the Height of an Object and Target Height
 - 6.8 REM Screen Results and Trouble-Shooting the REM Measurement
 - 6.9 Calibrating the Instrument, 3D Coordinates and Calibrate by back sight by Angle, back sight by Coordinate, Resection, Resection Notes and Coordinate Measurement
 - 6.10 Prepare and submit a final report for the project.
 - 7. Project on Bio-gas.**
 - 7.1 Select a suitable site for the project (May be a community or Institute campus).
 - 7.2 Make a reconnaissance and preliminary survey for the project.
 - 7.3 Draw the site plan of the project area showing different building.

- 7.4 Design a bio-gas plant for different capacity.
- 7.5 Draw the detailed drawing for the project work.
- 7.6 Estimate the different items of work.
- 7.7 Prepare a schedule of quantity with specification of the items of work of the project.
- 7.8 Prepare and submit a final report for the project.

8. Project on Steel Structure.

- 8.1 Select a line plan of a multi-storied (residential or commercial) building.
- 8.2 Draw the site plan and layout plan of the building.
- 8.3 Draw the plan, elevation and sections of the building.
- 8.4 Draw the detailed structural drawing of the building from given data.
- 8.5 Estimate the quantities of different items of civil work of a building including water supply & sanitary works and internal electrification works.
- 8.6 Prepare a schedule of quantities with specifications and the estimate building.
- 8.7 Prepare an abstract of cost from the estimate.
- 8.8 Prepare and submit a final report for the project

9. Project on Initial environmental examination (IEE) of a hydro-electric; bridge; dam; irrigation; construction; water treatment plant; sewage treatment plant; chemical/fertilizer plant; shrimp; leather project etc.

- 9.1 Select the type and location of a particular project.
- 9.2 Prepare a checklist with significant environment parameters.
- 9.3 Develop questionnaires to collect field data.
- 9.4 Complete initial environment examination (IEE) through checklist.
- 9.5 Prepare and submit a final report for the project

Note: 1 Report on any one of the project is to be submitted by a group of students consisting of not more than 6. The Head of the Department or the concerned guide teacher(s) may decide for similar project other than those as stated above.

Note: 2 The project is to be prepared covering the following components:

- 2.1 Project Title
- 2.2 Executing Agency
- 2.3 Objectives of the Project
- 2.4 Location of the Project
- 2.5 Project Implementation Period
- 2.6 Log frame
- 2.7 Procurement Plan
- 2.8 Year wise Financial and Physical Target Plan
- 2.9 Project management set-up
- 2.10 Cost Estimation of project

66472

Sanitary Engineering

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.
- To be able to understand the basic concept of ETP

SHORT DESCRIPTION

Sewage; 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; Effluent Treatment Plant; 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 sewage, sewer and sewerage system.

- 1.1 Define sewage, sewer and sewerage.
- 1.2 Compare various types of sewerage system.
- 1.3 Outline the advantages and limitations of sewerage system and septic tank.
- 1.4 Identify various types of sewers of a complete sewerage system.
- 1.5 Compare the advantages and limitations of uses of different kinds of sewer pipes according to materials of construction.
- 1.6 Draw the cross-section of different types of sewers, with different types of bedding.
- 1.7 Describe various kinds of joint in connecting the pipes with the help of sketches.
- 1.8 List the requirements of a good sewer joint.

2. Understand sewer appurtenances and their purposes.

- 2.1 Identify various sewer appurtenances.
- 2.2 Describe various sewer appurtenances with the help of sketches.
- 2.3 Discuss the factors to be considered for locating the sewer appurtenances.
- 2.4 Describe with neat sketch of siphon & inverted siphon.
- 2.5 Discuss the requirements of sewage pumps.
- 2.6 List various types of sewage pumps.
- 2.7 Describe the factors to be considered for locating the site of pumping station and state the capacity of pump and pumping stations.

3. Understand the process of designing sewers.

- 3.1 State different conditions of flow through a sewer.
- 3.2 Identify self cleansing velocity and grades of sewer.
- 3.3 Describe the formulas with notations for various kinds of flow of sewage.

- 3.4 Explain dry weather flow and storm weather flow.
- 3.5 Calculate the quantity of storm rain by: Rational method & Empirical method
- 3.6 Identify different hydraulic elements that govern the flow or discharge of sewage through a sewer.
- 3.7 Solve problems of discharge rates for circular sewers using cheese's formula.

4. Understand the principle of construction of sewers.

- 4.1 Explain general aspects for preparation of sewerage scheme.
- 4.2 Describe procedures followed in the construction of sewers.
- 4.3 Explain the procedure of laying a sewer in a trench.
- 4.4 Specify with sketch, the setting- out of the fall of sewer for the continuous gravitational flow of sewage.
- 4.5 Describe the techniques of testing sewer lines and the precautions should be taken during back filling of trenches.
- 4.6 State different ways of protection for sewer.
- 4.7 Describe the methods adopted for ventilating sewers.

5. Understand the process of maintenance of sewer.

- 5.1 Identify the need for maintenance of sewer.
- 5.2 Identify the precautions to be taken before entering in sewers.
- 5.3 Identify the factors to be considered for frequent inspection and supervision of sewer so that proper flow is maintained.
- 5.4 Describe the procedures used to clean and unlock sewer.

6. Understand the methods used for sewage disposal.

- 6.1 List various methods of sewage disposal.
- 6.2 State the characteristics of soil which influence waste water disposal.
- 6.3 Explain the term dilution and its suitability.
- 6.4 Describe septic tank.
- 6.5 Compare the design of septic tanks with a soak pit for 20, 50 and 100 users respectively.
- 6.6 Explain with sketches the construction and operation of a septic tank.

7. Understand the method of sewage treatment.

- 7.1 Identity the various conditions which directly affect the self purification of sewage in streams.
- 7.2 Outline the stages of sewage treatment.
- 7.3 Explain the purpose of preliminary sewage treatment.
- 7.4 Explain with the help of sketches: Detritus tanks (grit chambers) & Skimming tanks.
- 7.5 Describe the function of communicators.
- 7.6 Name different kinds of treatment process for removing impurities of each stage of the treatment process.
- 7.7 Describe the schematic layout of a typical sewage treatment plant.
- 7.8 Describe the vacuum flotation method for removing greases and oils.
- 7.9 Describe with the help of neat sketch of a sedimentation tank giving the factors, which reduce the efficiency of sedimentation tanks.
- 7.10 Explain the system of Effluent Treatment Plant.

8. Understand the process of sludge treatment and the method of disposal.

- 8.1 List the various sources of sludge.
- 8.2 Explain different purposes served by the sludge digestion.
- 8.3 Distinguish between anaerobic digestion and aerobic digestion.

8.4 Describe the working principles of a vacuum filters and drying beds.

8.5 Identify the methods of ultimate disposal of sludge.

8.6 Explain advantages and disadvantages of incinerating sludge.

9. Understand the water pollution and its effects on the environment.

9.1 Identify the undesirable changes and its effects of pollution on-

- a) Human life
- b) Animal life
- c) Aquatic life

9.2 Describe various sources of water pollution.

9.3 Classify different types of pollution and explain clearly each type of pollution.

9.4 Describe the precautions that should be taken to prevent pollution of water sources from domestic and industrial effluent disposal systems.

10. Understand the rural sanitation practices in Bangladesh.

10.1 Describe the ventilated improved pit (VIP) latrine and simple pit latrine.

10.2 Draw a neat sketch of VIP latrine and describe the special features of VIP latrine.

10.3 Mention the advantages & disadvantages of VIP and simple pit latrine.

10.4 Mention the advantages & disadvantages of single/twin pit pour flush latrine.

10.5 Describe the construction procedures of VIP, single and twin pit pour flush latrine.

11. Understand health and hygiene.

11.1 Describe the common diseases.

11.2 Explain the importance of hygiene education.

11.3 Describe the scope and methodology for hygiene education.

11.4 Explain the advantages of social mobilization for hygiene practice.

11.5 Explain integrated approach for water, sanitation and health education.

12. Understand the concept of biogas.

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

12.2 Explain the term biogas.

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

12.4 Describe the construction procedure of a biogas plant.

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

13. Understand the municipal and industrial solid waste and its management.

13.1 Describe the classification of municipal solid waste materials.

13.2 Describe the general sources of municipal solid waste.

13.3 Describe the garbage, rubbish and trash.

13.4 Mention the classification of different types of industrial solid waste.

13.5 Describe the hazardous industrial solid waste.

13.6 Describe the medical waste and its disposal.

13.7 List different steps for collecting solid waste according to category.

13.8 Mention different steps for disposal solid waste.

13.9 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.

- 1.1 Draw sketches of water closet suite which includes a commode, flushing cistern and connecting pipe etc. showing necessary dimensions.
- 1.2 Draw the sketches of bath tub, shower bath, urinals, lavatory or wash basin, sink, laundry tray, drinking fountain etc. showing dimensions including their levels.
- 1.3 Draw the sectional view of an automatic flushing tank with a flush valve and indicate individual name of each part.

2. Sketch manhole, septic tank and soak pit.

- 2.1 Draw the plan views and detail sectional views of manhole, septic tank and soak pit
- 2.2 Indicate the individual parts.
- 2.3 Show the dimensions of manhole, septic tank and soak pit.

3. 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.

4. Replace unserviceable sanitary fixtures.

- 4.1 Apply correct methods for repairing and replacing unserviceable sanitary fixtures.
- 4.2 Select proper tools and equipment and materials needed for repairing unserviceable fixtures.
- 4.3 Detect the defect of fixtures and get the work done.

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

6. 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. Sketch the Effluent Treatment Plant and show the different components in the figure.

- 7.1 Draw plan, section and sectional elevation of Effluent Treatment Plant.
- 7.2 Draw neat sketch of layout plan of pipe line.

8. Prepare a model of slab with water seal pan with ring.

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

REFERENCE:

1. Waste water Engineering - Metcalf & Eddy Inc
2. Internet

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. 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.

10. 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

66475 Water Resource Engineering

T P C
2 3 3

AIMS

- To provide understanding on the influence of the climatic condition of Bangladesh on its ground water and surface water flow
- To provide understanding of recharging of underground water and ascertain its necessity in Bangladesh.
- To enable to select a suitable source of water and method of irrigation for particular situation.
- To enable to select a suitable method of drainage for particular situation.
- To enable to select a suitable method for control of rivers and flood in Bangladesh.
- To understand rain water harvesting.

SHORT DESCRIPTION

Sources of water; Rainfall and run-off; Lifting of underground water; Storing and Recharging of ground/rain water; Irrigation and its effect; Well irrigation; Water requirements for crops; and quality of irrigation water; Storage reservoir; Dam and dyke; Irrigation canals; Silt deposit; Scouring; Canal works; Drainage; River training works; Flood and flood management and flood control; Irrigation projects in Bangladesh.

DETAIL DESCRIPTION

Theory:

1. Understand different hydrological terms.

- 1.1 Explain with neat sketch the hydrological cycle.
- 1.2 Explain the meaning of the following: Rainfall, Rainfall intensity and duration frequency relationship Run-off, Infiltration, Evaporation, Transpiration, Evapo-transpiration, Permeable and impermeable strata of soil, Ground water table, Precipitation, Aquifer.
- 1.3 Mention the characteristics of rainfall and run-off in Bangladesh.
- 1.4 Describe with sketches the various types of rain gauges.
- 1.5 List the factors affecting the run-off an area.
- 1.6 Determine average annual run-off of a catchments area from given data.

2. Understand the features of a well and recharging of ground water.

- 2.1 State the following terms with neat sketches: Cone of depression, Circle of influence, Draw down curve.
- 2.2 Express how to determine the yield of a well.
- 2.3 Solve the problems regarding lifting water from well.
- 2.4 Define storing and recharging of ground water/rain water.
- 2.5 Mention the condition of recharging of ground water is required.
- 2.6 List the methods of recharging of ground water.
- 2.7 Mention the advantages and disadvantages of recharging of ground water.
- 2.8 Predict the need for recharging of ground water in Bangladesh.

3. Understand the significance of irrigation.

- 3.1 Explain the necessity of irrigation in Bangladesh.
- 3.2 Mention the benefits of irrigation.
- 3.3 Describe about the present development of irrigation in Bangladesh.
- 3.4 Name different types of irrigation including sub-divisions.
- 3.5 Describe flow irrigation through flexible pipe.
- 3.6 Differentiate canal or direct irrigation with reservoir (tank) or indirect irrigation.
- 3.7 Describe different methods for lifting water for irrigation manually and by power.
- 3.8 Mention the advantages and disadvantages of well irrigation.
- 3.9 Explain the necessity of tube-well irrigation in Bangladesh.
- 3.10 Mention the advantages and disadvantages of tube-well irrigation.

4. Understand the concept of storage reservoirs.

- 4.1 State the meaning of storage reservoir.
- 4.2 Explain the necessity of storage reservoir
- 4.3 Mention the requirements of an ideal reservoir.
- 4.4 Explain the meaning of commendable area and irrigable area.
- 4.5 Calculate the capacity of a storage reservoir by using appropriate methods.
- 4.6 Mention the factors that determine the height of the dam of a reservoir.
- 4.7 Mention the section of a dam of reservoir with different components.

5. Understand the features of dam, dyke and irrigation canal.

- 5.1 State dam, core wall, dyke and irrigation canal.
- 5.2 Mention the favorable conditions for location of an earthen dam/ masonry dam.
- 5.3 Mention the advantages and limitations of an earthen dam/masonry dam.
- 5.4 Describe the construction procedure of an earthen dam/dyke.
- 5.5 Mention the remedies for preventing the failure of an earthen dam/dyke.
- 5.6 Differentiate between dam and dyke.
- 5.7 State main, branch, distributor, field canal and canal lining.
- 5.8 Mention the points to be considered in fixing the alignment of an irrigation canal.
- 5.9 Describe with sketches the distributor system of irrigation canals.
- 5.10 Describe the steps for excavating a new canal and old canal.

6. Understand silt deposition & scouring.

- 6.1 State river morphology, silt, siltation and scouring.
- 6.2 Mention the causes of siltation.
- 6.3 Mention the merits and demerits of siltation.
- 6.4 Describe the methods of preventing silt deposition into river and canal.
- 6.5 Describe the removal methods of silt from the river and canal.
- 6.6 Differentiate between silt excluder and silt ejector.
- 6.7 Describe the effect of scouring.
- 6.8 Describe the methods of preventing scouring.

7. Understand the features of head works.

- 7.1 State the meaning of head works.
- 7.2 Name the different components of a head works.
- 7.3 Explain the functions of each of the component of a head works.

8. Understand the principles of drainage.

- 8.1 State the meaning of drainage.
- 8.2 Mention the different methods of drainage.
- 8.3 State the meaning of cross drainage works.
- 8.4 Mention the functions of cross drainage works.
- 8.5 Differentiate between aqueduct and super passage.
- 8.6 Mention the need for drainage in Bangladesh.

9. Understand the necessity of river training works.

- 9.1 State the meaning of river training.
- 9.2 Outline the objectives of river training works.
- 9.3 Mention the different methods of river training works.
- 9.4 Mention the functions of guide bank, groyne, spur, afflux, marginal bund and stone apron.
- 9.5 Explain the necessity of river training works in Bangladesh.

10. Understand the concept of flood and flood control.

- 10.1 State the meaning of flood.
- 10.2 Mention the causes of flood.
- 10.3 Mention the different methods of controlling flood.
- 10.4 Specify the causes of flood in Bangladesh.
- 10.5 Describe suitable method(s) for flood control in Bangladesh.

10.6 State coastal embankment project and inland river embankment project.

10.7 Describe the flood forecasting procedure in Bangladesh.

11. Understand different irrigation projects in Bangladesh.

- 11.1 Write short history of irrigation in Bangladesh.
- 11.2 Give an overview of Ganga-Kapatakhha (G-K) Project.
- 11.3 Give an overview of Teesta Barrage Project.
- 11.4 Give an overview of Chalan Beel Development Project.
- 11.5 Give an overview of Chandpur Irrigation Project.
- 11.6 Give an overview of Barisal Irrigation Project.
- 11.7 Give an overview of North Bengal Deep Tube Well Project.
- 11.8 Give an overview of Pabna Irrigation and Flood Control Project.

PRACTICAL:

- 1. Measure rainfall by rain gauge and determine the intensity of rainfall.
- 2. Disassemble and assemble common hand pump/Tara pump.
- 3. Install hand pump/Tara pump.
- 4. Draw neat sketch of cone of depression with draw down and circle of influence.
- 5. Draw neat sketch of rain gauges commonly used in Bangladesh.
- 6. Draw the section of a dam of a reservoir with components.
- 7. Draw neat sketch of distribution system of irrigation.
- 8. Draw neat sketch of head works with components.
- 9. Draw neat sketch of guide bank, groyne, spur, afflux, marginal bund and stone apron.
- 10. Prepare a model for a typical irrigation project.
- 11. Visit an irrigation and flood control project in Bangladesh.

REFERENCE BOOKS

- 1. Hydrology- Raghunath
- 2. Irrigation Engineering and Hydraulic structure- Santosh Kumar Garg
- 3. Introductory Irrigation- B C Punmia
- 4. Irrigation – Esrailson
- 5. Irrigation Engineering and Hydraulic Structure - Santosh Kumar Garg
- 6. Introductory Irrigation Engineering - B C Punmia
- 7. www.bwdb.gov.bd (For idea about mentioned project)

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 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 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

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 7th 5 years plan
- 11.9 Mention the link of 7th 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