



3170623 Port and Harbor Engineering

SEMESTER: 7



CIVIL ENGINEERING DEPARTMENT
GOVERNMENT ENGINEERING COLLEGE - DAHOD

Academic Year: 2024-25

:: VISION STATEMENT OF THE INSTITUTE ::

To be a value-based engineering institute to disseminate globally acceptable education and nurturing research, innovation and entrepreneurship.

:: MISSION STATEMENTS OF THE INSTITUTE ::

1. To provide quality education in the engineering disciplines through creative balance of academics and extracurricular programs.
2. To provide learning environment for innovation and entrepreneurship.
3. To disseminate ethical values, social values and sensitivity towards environmental issues.

:: VISION STATEMENT OF THE CIVIL ENGINEERING DEPARTMENT ::

To be a recognized department in the field of civil engineering education to produce professional civil engineers, innovators and entrepreneurs for the development of the society.

:: MISSION STATEMENTS OF THE CIVIL ENGINEERING DEPARTMENT ::

1. To provide quality education to civil engineering undergraduates through creative balance of academic, professional and extra-curricular activities.
2. To impart knowledge in the field of civil engineering for the development of infrastructure facilities with environmental concern for betterment of the society.
3. To contribute in the nation's development through innovative ideas in the field of civil engineering.

:: PROGRAM OUTCOMES (POs) ::

Program Outcomes (POs) as identified by National Board of Accreditation (NBA), India are the attributes that the students are expected to attain at the point of graduation. Following are the POs of B.E Civil Engineering program:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The Engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

:: PROGRAM SPECIFIC OUTCOMES (PSOs) ::

Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering program should be able to do at the time of graduation.

Civil Engineering Graduates shall have

PSO 1: Ability to analyze, design and rehabilitate the infrastructural projects of civil engineering.

PSO 2: Ability to use advanced civil equipment, software, techniques and work seamlessly in teams.

PSO 3: Ability to apply gained knowledge to choose from the innovative career paths, to be an entrepreneur, and a zest for higher studies.

:: PROGRAMME EDUCATION OBJECTIVES (PEOs) ::

Program Educational Objectives (PEOs) describe the career and professional accomplishments that programs are preparing graduates to attain within a few years (3-5 years) of graduation.

Following are the PEOs of B.E Civil Engineering Program:

1. Establish themselves as civil engineering professionals in government, public and private sectors
2. Manage infrastructural and sanitary facilities
3. Solve real world problems environmental concerns to serve society
4. Adapt to changing trends in analysis and design of civil engineering structures.
5. To do testing, survey and planning of civil engineering structures using modern tools

:: COURSE OUTCOMES (COS) ::

Course Outcomes are narrower statements that describe what students are expected to know, and be able to do at the end of each course. These relate to the skills, knowledge, and behaviour that students acquire in their matriculation through the course.

PROGRAM NAME: B.E. CIVIL ENGINEERING		
COURSE NAME: 3170623 Port and Harbor Engineering		
SEMESTER: 7	A.Y 2021-22	Weightage %
3170623.1	understand important planning concepts of harbor and ports	30%
3170623.2	know important functional components of harbor and ports	30%
3170623.3	understand important design concepts of harbor and ports components	40%

DISTRIBUTION OF THEORY MARKS					
R Level	U Level	A Level	N Level	E Level	C Level
15%	15%	20%	20%	15%	15%

Legends: **R**: Remembrance; **U**: Understanding; **A**: Application; **N**: Analyze; **E**: Evaluate **C**: Create and above Levels (As per revised Bloom's Taxonomy)

:: TEACHING AND EXAMINATION SCHEME ::

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	1	0	4	70	30	0	0	100

ESE - END SEMESTER EXAMINATION, **PA** - PROGRESS ASSESSMENT, **ALA** - ACTIVE LEARNING ASSIGNMENTS, **OEP** - OPEN ENDED PROBLEM

REFERENCE BOOKS ::

1. Dr. S. K. Khanna, M.G.Arora and S.S. Jain, Airport Planning & Design, Nem Chand & Bros.,Roorkee
2. IS Codes: 4651 (Part I to V), 7314, 9527 (Part I, III, IV, VI), 10020 (Part IV).
3. R. Srinivasan and S. C. Rangwala, Harbour, Dock and Tunnel Engineering, 1995, Charotar Pub.House, Anand
4. S. P. Bindra, A Course in Docks and Harbour Engineering, 1992, DhanpatRai& Sons, NewDelhi
5. Alonzo Def. Quinn, Design and Construction of Ports and Marine Structure, McGraw - Hill Book Company, New York

Tutorial – Course Outcome matrix

	Course Outcomes (COs):						
CO-1	understand important planning concepts of harbor and ports						
CO-2	know important functional components of harbor and ports						
CO-3	understand important design concepts of harbor and ports components						
Sr. No.	Tutorial	CO 1	CO 2	CO 3			
1.	INTRODUCTION TO WATER TRANSPORTATION	√					
2.	PORT PLANNING	√	√				
3.	NATURAL PHENOMENA	√	√	√			
4.	HARBOUR INFRASTRUCTURES		√	√			
5.	PORT AMENITIES, OPERATION & NAVIGATIONAL AIDS	√	√	√			
6.	SEAPORT MAINTENANCE		√				
7.	IMPACT ANALYSIS			√			

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(Progressive Assessment Sheet)

Sr. No.	Tutorial	Page No.	Date of assigning	Date of submission	Assessment Marks	Sign. Of Teacher with date	Remarks
1.	INTRODUCTION TO WATER TRANSPORTATION		19-Jul-24	02-Aug-24			
2.	PORT PLANNING		02-Aug-24	16-Aug-24			
3.	NATURAL PHENOMENA		16-Aug-24	30-Aug-24			
4.	HARBOUR INFRASTRUCTURES		30-Aug-24	13-Sep-24			
5.	PORT AMENITIES, OPERATION & NAVIGATIONAL AIDS		13-Sep-24	27-Sep-24			
6.	SEAPORT MAINTENANCE		27-Sep-24	11-Oct-24			
7.	IMPACT ANALYSIS		11-Oct-24	18-Oct-24			
Total							

ASSIGNMENT 1 : INTRODUCTION TO WATER TRANSPORTATION

- Q-1 What are the important developed routes of Water transportation in India? Explain any three routes with their significance CO1
- Q-2 Classify the harbours based upon protection needed with neat sketch. CO1
- Q-3 Briefly describe the classification of harbour based on utility and location. CO1
- Q-4 What are the site selection criteria for harbour? CO1
- Q-5 Enlist the various types of marine surveys to be carried out before finalising the layout of harbour. Briefly describe the Hydrographic and Topographic survey. CO1
- Q-6 Define – Load line, Displacement load, Displacement light, Dead weight tonnage, Gross tonnage, Net tonnage, Cargo tonnage, Ballast CO1
- Q-7 Which types of facilities are necessary to be provided at a major port? CO1
- Q-8 Differentiate between a port and harbour. CO1
- Q-9 During harbour planning process, which important facts to be studied and scrutinized before finalising layout? CO1
- Q-10 What are the factors to be considered for determining size and location of harbour entrances? CO1

ASSIGNMENT 2 : PORT PLANNING

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|------|--|-----|
| Q-1 | Describe the requirements of a good port. | CO1 |
| Q-2 | What are the site selection criteria for major port? | CO1 |
| Q-3 | Draw a layout of port with all necessary ancillary facilities for major port. | CO1 |
| Q-4 | What is Dry port? Briefly explain various functions of Dry port. | CO2 |
| Q-5 | What is bulk cargo in water transportation? Give examples of bulk cargo. | CO2 |
| Q-6 | What do you understand by term 'port of call'? Explain types of port of call. | CO2 |
| Q-7 | What are the methods of forecasting cargo and passenger? Briefly explain each in detail. | CO1 |
| Q-8 | Write a short note on 'cargo handling capacity' | CO1 |
| Q-9 | Briefly describe about 'Transshipment ports'. | CO1 |
| Q-10 | What are the principles of port planning? | CO1 |

ASSIGNMENT 3 : NATURAL PHENOMENA

Q-1 Briefly describe : CO1

Littoral drift, Neap tide, Spring tide, Fetch, Tidal range, Wave parameters.

Q-2 Explain the following with neat sketch: CO2

Deflection, Refraction, Diffraction, Reflection

Q-3 Draw wind rose diagram and explain its application. Describe various types of wind rose diagram. CO3

Q-3 Calculate the volume of tidal prism for a harbour having following records. CO3

Spring tidal range in m	Neap tidal range in m	Area of water surface in hectare
5.20	3.20	(a) at H.W.S.T. = 2545 (b) at H.W.N.T. = 1980 (c) at L.W.N.T. = 1680 (d) at L.W.S.T. = 1250

Q-4 Draw a wind rose diagram for the given data. CO3

Direction of wind	% of days wind passes through direction
N	30
NE	7
E	5
SE	15
S	12
SW	6
W	4
NW	18
Calm	3

Calculate

- (i) intensity of pressure due to wind in Kg/m^2 , if value of constant $C = 0.0030$ and velocity of wind = 30 kmph
- (ii) Total wind force in Kg, if area of exposed surface $A = 2500 \text{ m}^2$, Shape factor $K_s = 1.4$

Q-5 The data of wave height and their frequency are collected for any port area. All data are summarized in the following table. Draw a wave rose diagram for the given data. CO3

Group of wave height in meter	Group of wave period in seconds					
	3-6	6-9	9-12	12-15	15-18	18-21
0.3-0.6	--	0.85	9.2	13.6	0.97	1.22
0.6-0.9	--	0.95	11.3	9.20	0.90	0.90
0.9-1.2	--	0.25	5.20	5.20	0.25	0.34
1.2-1.5	--	3.20	14.5	4.30	0.89	--
1.5-1.8	--	1	4.50	2.41	0.20	--
1.8-2.1	--	3.28	3.27	0.32	0.03	--
2.1-2.4	0.04	0.40	0.30	0.20	--	--
2.4-2.7	0.03	0.30	0.20	0.12	--	--
2.7-3.0	--	0.18	--	--	--	--

Determine maximum wave height observed from the diagram and Direction of maximum wave height.

ASSIGNMENT 4 : HARBOUR INFRASTRUCTURES

- Q-1 Calculate the width of entrance channel, radius of turning basin and channel depth from the following data: CO3
- (i) Beam of the ship = 25 m
 - (ii) Length of largest ship = 226 m
 - (iii) Draft of the largest ship to be accommodated = 5 m
 - (iv) Height of storm waves = 3 m
 - (v) Speed through water = 15 kmph
 - (vi) Block coefficient = 0.90
- Q-2 What are the different types of break waters? Under which condition, rubble mound type break water is provided? CO3
- Q-3 Explain the various methods constructing mound type break water. CO2
- Q-4 In which conditions, vertical break water is provided? CO3
- Q-5 Differentiate between mound type break water and wall type break water CO2
- Q-6 What are the factors deciding height of break water? CO3
- Q-7 Briefly explain – Special types of break waters. CO3
- Q-8 Explain the design principles of a wet dock. Differentiate between wet dock and tidal basin. CO3
- Q-9 Compare wet dock and dry dock with sketch. CO2
- Q-10 What do you understand by repair docks? Explain various types of repair docks. CO2
- Q-11 Write a short note on Floating dock CO2
- Q-12 Draw a plan and elevation of entrance lock. Briefly describe the working of entrance lock. CO2
- Q-13 Explain the various types of lock gates with their design principles. CO3
- Q-14 What are the forces acting on graving dock? CO3

- Q-15 What are the design criteria block work wharf walls? Which aspects to be studied for finalizing shape and dimension of concrete block in wharf wall? CO3
- Q-16 Explain the criteria of dimensioning of wharf wall. CO3
- Q-17 Calculate the displacement weight of vessel in tonnes for the given data. CO3
- (i) Length of vessel between perpendiculars , $L = 200$ meter
 - (ii) Breadth of the vessel at the waterline amidships, $B = 20$ metre
 - (iii) Mean of the draft of the vessel fore and aft $D = 8.50$ metres
 - (iv) Block coefficient, $C = 0.65$
- Q-18 For the designing a depth of channel, what are the factors to be considered? CO3
- Q-19 What are the design criteria for selection of dimension of pier, wharf and apron as per IS : 4651 (Part – V)? CO3
- Q-20 What are the design criteria for selection of berthing area, passenger and manoeuvring area, turning basin, anchorage area and offshore mooring as per IS : 4651 (Part – V)? CO3

ASSIGNMENT 5 : PORT AMENITIES, OPERATION & NAVIGATIONAL AIDS

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| Q-1 | Write a short note with sketch on | CO2 |
| | (i) Light house | |
| | (ii) Existing ferry services with their significance | |
| Q-2 | Differentiate between Transit sheds and Warehouses | CO2 |
| Q-3 | Describe the importance of cold storage at port. | CO2 |
| Q-4 | Enlist the equipments used for cargo handling at port. Describe any three with neat sketch. | CO2 |
| Q-5 | Explain various types of floating signals. | CO2 |
| Q-6 | Differentiate between floating type mooring and fixed type mooring. | CO3 |
| Q-7 | What is the necessity of providing signal at harbour? Explain various types of signal. | CO2 |
| Q-8 | What do you understand by single point mooring? | CO2 |

ASSIGNMENT 6 : SEAPORT MAINTENANCE

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| Q-1 | Why shore protection works are required? Briefly describe the various types of shore protection works. | CO2 |
| Q-2 | What do you understand by dredging? Why dredging is to be carried out at port and harbour? | CO2 |
| Q-3 | Explain the procedure of disposing dredged material. | CO2 |
| Q-4 | Classify the various types of dredgers. Explain any three types of dredgers with neat sketch. | CO2 |
| Q-5 | What are the factors affecting selection of dredging equipments? | CO2 |

ASSIGNMENT 7 : IMPACT ANALYSIS

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|-----|--|-----|
| Q-1 | What are the basic principles of economical analysis of port project? | CO3 |
| Q-2 | What are the different methods of economical evaluation of port projects? Explain each method | CO3 |
| Q-3 | Compare the various methods of economical evaluation of port project. | CO3 |
| Q-4 | Explain the different methods used for identification and evaluation of environmental impacts of port and harbour. | CO3 |
| Q-5 | Enlist probable impacts of port and harbour on water, air, land and noise environment. | CO3 |