# 3170623

# 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 educationand nurturing research, innovation and entrepreneurship.

## :: MISSION STATEMENTS OF THE INSTITUTE ::

1. To provide quality education in the engineering disciplines through creative balance ofacademics and extracurricular programs.

2. To provide learning environment for innovation and entrepreneurship.

3. To disseminate ethical values, social values and sensitivity towardsenvironmental 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.

# Annexure I: Knowledge and Attitude Profile (WK)

1. WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
2. WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
3. WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
4. WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
5. WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
6. WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
7. WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
8. WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
9. WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.



# :: PROGRAM OUTCOMES (POs) ::

1. PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4

respectively to develop to the solution of complex engineering problems.

2. PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9. PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
10. PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

## :: 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 | Examination Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| L | T | P | C | 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

| | | |
|---|---|---|
| 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<br>(b) at H.W.N.T. = 1980<br>(c) at L.W.N.T. = 1680<br>(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 $m^2$, Shape factor Ks = 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:<br>(i) Beam of the ship = 25 m<br>(ii) Length of largest ship = 226 m<br>(iii) Draft of the largest ship to be accommodated = 5 m<br>(iv) Height of storm waves = 3 m<br>(v) Speed through water = 15 kmph<br>(vi) Block coefficient = 0.90 | CO3 |
| 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.<br>(i) Length of vessel between perpendiculars , L = 200 meter<br>(ii) Breadth of the vessel at the waterline amidships, B = 20 metre<br>(iii) Mean of the draft of the vessel fore and aft D = 8.50 metres<br>(iv) Block coefficient, C = 0.65 | CO3 |
| 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

| | | |
|---|---|---|
| Q-1 | Write a short note with sketch on<br>(i) Light house<br>(ii) Existing ferry services with their significance | CO2 |
| 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

| | | |
|---|---|---|
| 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

| | | |
|---|---|---|
| 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 |