

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

**COURSE CURRICULUM
COURSE TITLE: DOCKS, HARBOUR AND TUNNEL ENGINEERING
(COURSE CODE: 3366004)**

Diploma Programme in which this course is offered	Semester in which offered
Transportation Engineering	Sixth

1. RATIONALE

India has a very large coastal line and therefore coastal shipping plays a very vital role in the development and growth of economy of our country. Docks and Harbour are the integral part of coastal shipping transport system. Therefore, knowledge and understanding of various construction and maintenance aspects of docks and harbours are very important for engineers working at site in order to make shipping transport system safe and efficient. A diploma engineer is expected to implement and maintain the civil engineering aspects of the docks and harbours for the safe operation and management of all the systems related to it.

Tunnels are required to be made for underground metros passing through cities or for roads/rails crossing the hills. Tunnels are also required for making subways for pedestrian crossing the busy roads. Thus, knowledge about tunnel design features and its maintenance are important for civil engineers. This course attempts to build knowledge and skills required for design and maintenance of Docks, Harbours and Tunnels.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Explain the design features of docks, harbour and tunnels.**
- **Plan and supervise the construction and maintenance of docks, harbours and tunnels.**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- i. Prepare master plan for harbour site considering natural phenomenon and different harbour elements
- ii. Supervise the construction of berthing structure
- iii. Identify the requirement of navigational aids and cargo storage facilities
- iv. Supervise the tunnel construction work
- v. Carry out maintenance process of tunnel

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment.

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (In Cognitive Domain)	Topics and Sub-topics
Unit – I Natural Phenomenon, Planning and Site Investigations	1a. Explain different natural ocean phenomena 1b. Describe the different types of harbours 1c. Describe the design consideration for ocean structures 1d. Discuss the master plan for port planning 1e. Explain the procedure to undertake hydro-graphic and Topographic Survey	1.1 Natural phenomena: Wind, Tide, Current. 1.2 Types of harbours. 1.3 Design consideration for ocean structures. 1.4 Port administration 1.5 Choice of site for harbour. 1.6 Master plan for port planning. 1.7 Hydro-graphic and Topographic Survey
Unit – II Berthing Structures: Fenders and Moorings	2a. Explain general selection and design aspects of Berthing Structures 2b. Justify the need for Fenders and Mooring system 2c. Describe about the different types of fender system 2d. Explain about the energy absorbed by fenders during berthing.	2.1 Berthing structures: Piers, wharfs, Quarry, walls, and jetties. 2.2 Dolphins, Trestles, moles, and Moving Accessories. 2.3 Fenders: Types of fender system. 2.4 Mooring system
Unit – III Navigational Aids, Coastal Erosion and Protection, Cargo Storage Facilities	3a. Explain the need of navigational aids 3b. Describe the features and function of differentiate navigational aids: Buoys, Beacon, Light ship, Range light, Radar Reflectors 3c. Describe the impact of coastal zones and beach profiles. 3d. Justify the need for berth nourishment 3e. Describe the function of water houses and the methods to maintain them. 3f. Describe the features of protection	3.1 Navigational aids: Buoys, Beacon, Light ship, Range light, Radar Reflectors. 3.2 Coastal zones and beach profile, Coastal protection works. 3.3 Berth nourishment 3.4 Transit Shed: Purpose, area required, diversion. 3.5 Water houses: Open storage, cold storage building, Port administration building

Unit	Major Learning Outcomes (In Cognitive Domain)	Topics and Sub-topics
	works and Cargo Storage facilities	
Unit– IV Tunnel, Survey and Construction	4a. Justify the necessity of tunnels and their classifications. 4b. Describe the effect of shape and size of tunnel for survey work 4c. Describe the characteristics of different types of explosives. 4d. Describe the characteristics of different types of detonators	4.1 Tunnel: Shape, size and Survey work. 4.2 Explosives: Types, Quantity, Precaution in handling and transporting, 4.3 Detonators: Types, Method of blasting. 4.4 Shaft: construction, location, size, shape
	4e. Describe the construction of shaft 4f. Describe the tunnelling methods and the equipment used therein.	4.5 Tunnelling methods in: soft soil, rock and contraction 4.6 Tunnelling Equipment
Unit– V Tunnel Lining, Ventilation and Drainage System	5a. Justify the need of lining and formwork. 5b. Describe the method of ventilation. 5c. Describe drainage system in tunnels to dewater.	4.1 Tunnel lining: Types of lining, Materials for lining, concrete lining. 4.2 Tunnel ventilation. 4.3 Water sources, water handling, dewatering and permanent drainage.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS and MARKS (Theory)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Natural Phenomenon, Planning and Site Investigations	08	4	3	6	13
II	Berthing Structure-Fenders and Moorings	08	3	3	7	13
III	Navigational Aids, Coastal Erosion and Protection, Cargo Storage Facilities	10	6	6	6	18
IV	Tunnel Surveying and Construction.	08	3	4	6	13
V	Tunnel Lining, Ventilation and Drainage system.	08	3	4	6	13
Total		42	19	20	31	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

7. SUGGESTED EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S.No.	Practical/Exercise (Outcomes in Psychomotor Domain)	Approx. Hours Required
1	Draw five different sketches with detailed description based on above five units (faculty may suggest/approve the structure to be sketched)	10
2	Prepare report on design features of docks, harbours and tunnels.	6
3	Prepare presentations in group of three on some related topic beyond curriculum and present in classroom seminar	4
4	Visit to nearby Docks/Harbour/Tunnel and prepare a report with sketch.	4
5	Prepare a detailed case study on design of one particular type of Docks/Harbour/Tunnel	4
Total		28

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- i. Visit nearby Dock/Harbour/Tunnel Structure and submit report.
- ii. Draw sketches of harbour structures
- iii. Documentation of the case study on docks, harbour and tunnel.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Arrange expert lectures by engineers having experience of design of docks/harbour/tunnel design, construction and maintenance.
- ii. Arrange site visits to different types of docks/harbour/tunnel
- iii. Show video/animation films depicting construction/maintenance procedures of different type of docks/harbour/tunnel

10. SUGGESTED LEARNING RESOURCES

A) Books

S. No.	Title of Books	Author	Publication
1	Dock and Harbour Engineering	Oza, H P; Oza, G H	Charotar Publishers. Anand
2	A course in Docks and Harbour Engineering	S.P.Bindra	Dhanpat Rai Publications, New Delhi
3	Harbours, Docks and Tunnel Engineering	R. Srinivasan	Charotar Publishing House, Anand
4	Road, Railway, Bridge and Tunnel Engineering	Ahuja and Birdi	Standard book house Delhi

B) Major Equipment/Materials

No Equipment or Material required

C) Software/Learning Websites

- i. www.amazon.com/Dock-Harbour-Engineering
- ii. books.google.co.in › Technology and Engineering › Civil › General
- iii. www.cphbooks.in
- iv. nptel.iitm.ac.in

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. Prakash. A. Pandya**, Lecturer in Civil Engg. Deptt. Govt. Polytechnic, Himatnagar

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr Subrat Roy**, Professor, Department of Civil and Environmental engineering
- **Dr K. K. Pathak**, Professor, Department of Civil and Environmental engineering