GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Civil (Water Resource Engineering)

Course / Subject Code: ME01033061

Course / Subject Name: Coastal Engineering

w. e. f. Academic Year:	**2024-25**
Semester:	1st Semester
Category of the Course:	PEC

Prerequisite:	Basic fluid mechanics and hydrodynamics, Theory of structure
Rationale:	Students will be able to understand the elementary knowledge of Coastal Engineering and Oceanography. They will be able to comprehend the various wave behaviors and theories of wave mechanics. They will learn about the coastal processes and their effects, the application of RS & GIS, and simulation models. They will get basic knowledge about onshore and offshore marine structures.

Course Outcome:

After Completion of the Course, Student will able to:

No	**Course Outcomes**	**RBT Level**
01	Understand the different coastal parameters and sea structures,	R Level
02	Investigate and deal with real-world problems for coastal zone management,	U Level
03	Apply the wave break theories and formulate wave motion problems,	A Level
04	Analyze wave forces and sediment transportation,	N Level
05	Detect the change analysis and assess the coastal processes using RS-GIS and simulation model software.	E Level

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			**Total Credits L+T+ (PR/2)**	**Assessment Pattern and Marks**				**Total Marks**
				Theory		**Tutorial / Practical**		
L	**T**	**PR**	**C**	ESE (E)	PA (M)	PA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction to Coastal Engineering:** Coastal Zone and its features; Basic terminologies of coastal landforms; Coastal region and specific economic zone; Coastal Zone Management; Understanding of coastal system behavior. **Physical Oceanography:** Description of the world's ocean; Coastal states of India: Coastline, characteristics and its significance; Ocean currents; and circulation; Seabed characteristics.	06	15
2.	**Motion Parameters:** Significance and Characteristics of wind, tide, and current; Ocean waves along the coast; Classification of ocean waves; Wave statistics; Zonation based on the behavior of waves; Wave deformation and its causes; Wave forces and Surf zone processes.	08	20
3.	**Wave Mechanics:** Small and finite amplitude wave theories, Wave deformation phenomenon- Refraction, Diffraction, and Reflection, Wave breaking, Types of wave breaking, Non-breaking forces on the vertical structure, Breaking and broken waves based on linear theory. Variation in Coastal Water Level: Long-term water level changes; Fluctuations in water level and its effects due to global climate changes; Causes and effects of Tsunamis, Cyclone, and Storm surge; Application of RS & GIS; Application of simulation models software like MIKE 21, Delft3D, CSHORE, Telemac-2D, etc.	12	25
4.	**Coastal Zone Processes:** Key Processes-Erosion, Transportation, and Deposition; Factors influencing coastal processes, Impacts of coastal processes; Beach features; Beach profile; Bed forms; Characteristics of coastal sediments, Types of sedimentation loads; Modes of sediment transport; Bed load transport equations, Mechanics of suspended sediment transport; Suspended Sediment Concentration under currents; Short-term and Long-term changes of shores; Littoral drift.	14	25
5.	**Sea Structures:** Necessity of coastal protection work; Types of coastal protection works - Sea walls, Groyne, Types of groyne, Breakwater, its classification, and effects; On-shore and off-shore structures- Types of harbours with features, Port planning, Site investigation and selection for the port, Tetra pod, Tri-bar.	05	15
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	30	20	15	20	00

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Fredsoe,J. and Deigaard,R., Mechanics of Coastal Sediment Transport, World Scientific, 1995.
2. Reeve Dominic, Andrew Chadwick and Chris Fleming, Coastal Engineering: Processes, theory and design practice, London: CRC Press, Taylor & Francis Group, 2012.
3. Dean,R.G. and Dalrymple,R.A., Water wave mechanics for Engineers and Scientists, Prentice-Hall, Inc., Englewood Cliffs,New Jersey, 1994.
4. Robert M. Sorensen, Basic Coastal Engineering, Springer, 2006
5. R. Shrinivasan and S.C. Rangwala, Harbour,Dock and Tunnel Engineering, Anand: Charotar Publication House, 1995.
6. Alonzo Def.Quinn, Design and Construction of Ports and Marine Structures, McGraw Hill Book Company, 1972.

(b) Open source software and website:

1. **http://www.nptel.iitm.ac.in/courses/**
2. **https://nptel.ac.in/courses/114105002**
3. **https://link.springer.com/book/10.1007/b101261**
4. **https://www.nio.res.in/**

Suggested Course Practical List:

The work may include real-site visits, high-end computing systems, and deal with experimental/model labs for different wave measurements and change analysis. The students may work in a group for the practice such as:

1. Visit and study different coastal structures.
2. Overview of physical models and different measurement techniques for applications in testing of Ocean, offshore, and coastal structures.
3. Computation of the wave forces,
4. Derive the different wave theory.

5. Change analysis of water level using RS and GIS
6. Analysis of coastal processes using simulating model software.
7. A critical study on historical occurrences of Tsunami and Storms.

List of Laboratory/Learning Resources Required:

GIS related high end computing system,

Image Processing Software, Software related with Numerical Modeling like MIKE 21, Delft3D, CSHORE, Telemac-2D, etc.

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