Module Descriptor Form

Civil and Environmental Engineering

CL814 - Coastal Engineering

Module Code	CL814	**Module Title**	Coastal Engineering				
Module Registrar	Kamranzad, Dr Bahareh						
Other Staff Involved							
Credit Weighting	10	**Semester**	2	**Elective**	Yes	**Academic Level**	5
Pre-requisites							
Required for							

Module Format and Delivery (hours):

Lectures	Tutorials	Assignments	Labs	Private Study	Total
15	0	40	0	45	100

Educational Aim

This module aims to:

This module aims to develop students' understanding of the core principles of Coastal Engineering, equipping them with the knowledge and skills to analyse coastal processes, assess risks, and design sustainable solutions for coastal protection and management. Through a combination of theoretical and applied learning, students will explore the interactions between oceanic phenomena (waves, tides, and currents) and coastal environments, examining their impact on coastal stability, hazards, and resilience. The module will also introduce strategies for mitigating coastal disasters, sustainable coastal zone management, and the role of ocean renewable energy in supporting climate adaptation and resilience. By the end of the module, students will be able to critically evaluate coastal engineering challenges and propose engineering-based solutions that align with environmental sustainability and societal needs.

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Syllabus

This module will teach the following:

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1. Definition of coastal engineering and coastal terms: shore, coast, shoreline, coastline, coastal hinterland, foreshore, backshore, breaker zone/surf zone, littoral zone, closure depth, littoral transport/longshore transport/littoral drift, nearshore zone, offshore zone, etc.
2. Coastal hydrodynamics: wind, waves (capillary, gravity, long, sea, swell), currents, water level fluctuations (astronomical tides, storm-surge, seiche, natural climatic fluctuations, sea level rise, subsidence and rebound, tsunamis)
3. Coastal processes in shallow waters and wave transformation: shallow water effects (shoaling, refraction, bottom friction, breaking, set-up/set-down, swash or uprush, run-up) and wave-structure interaction (diffraction, reflection, overtopping)
4. Classification of beach material and coastal profile and classification of coastlines: Materials supplied by rivers and materials supplied by the erosion of the land masses, exposed littoral dune or cliff coast, moderately exposed littoral dune or cliff coast, protected or marshy coast, tidal flat coast, monsoon coast or swell coast, muddy coast with mangrove vegetation, coral coast, protected, moderately exposed and exposed coastlines.
5. Causes of coastal disasters: Erosion (chronic/long term and acute erosion, natural causes, human causes) and flooding (extreme tide, seasonal variation, storm surge, tsunami)
6. Different methods for coast and shore protection: management of the coast, dune stabilization, cliff stabilization, fixing of the coastline by structures, seawall, revetment, bulkhead), mixed Coast/Shore protection (groynes, detached/submerged/floating breakwaters, perched beach, cove) and shore protection (nourishment, beach scraping, beach de-watering or beach drain)
7. Climate change impact: Sea Level Rise, Historical trends, Global Climate Models (GCMs), increased flooding, erosion and storminess
8. Ocean renewable energy (ORE) and climate change impacts: ORE including wind, wave, tidal, current, salinity gradient and ocean thermal energy
9. Numerical models in Coastal Engineering: A practical numerical wave simulation
10. A coastal engineering project as a case study and its environmental impacts

Learning Outcomes

On Completion of the module, the student is expected to be able to:

LO: 1	Analyse and interpret coastal terms, beach materials, and coast types to assess their impact on coastal processes
LO: 2	Evaluate ocean hydrodynamic and shallow water processes to predict coastal behaviour under various conditions
LO: 3	Assess the causes of coastal disasters and propose effective protection measures for vulnerable coastal areas
LO: 4	Estimate ocean renewable energy potential and develop strategies for efficient resource extraction

(UK SPEC suggests no more than 4 learning outcomes per module. Statements must be broad and be syllabus free and link in with the intended learning outcomes on the programme specifications.)

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Assessment of Learning Outcomes - Criteria

Learning Outcome: **1**

	Criteria
1	Demonstrate the ability to identify the meaning of various coastal terms and detect them in a coastal zone.
2	Demonstrate understanding of different types of beach materials.
3	Demonstrate the ability to identify different coast types based on their understanding of various coastal profile and their exposure to open ocean.

Learning Outcome: **2**

	Criteria
1	Demonstrate understanding of various ocean phenomena and basically what happens in the oceans from physical oceanography point of view.
2	Demonstrate the ability to estimate how the wave characteristics transforms in shallow water.

Learning Outcome: **3**

	Criteria
1	Identify the causes of coastal disasters based on their understanding about coastal processes and extreme events.
2	Demonstrate the ability to differentiate between coast and shore protection measures.
3	Propose the suitable measures for coastal protection depending on the characteristics of a particular coast.

Learning Outcome: **4**

	Criteria
1	Demonstrate understanding of various types of ocean renewable energy and how they can be estimated.
2	Identify the areas where ocean renewable hotspots are located.
3	Demonstrate the understanding of the mechanism in which ocean renewable energy can be harvested.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

To Pass the module, students need to gain a summative mark of: 50%

Description	Semester	Start Week	Duration	Weight	Submission Week	Linked Criteria
Coursework (individual task)	2	5		30%	7	
Project (group task)	2	7		30%	11	
Final-term examination. Closed Book	2		1.00	40%	E	

Principles of Assessment Feedback

This module incorporates the following principles in line with the University's Assessment and Feedback Policy :
- Includes a combination of formative (quizzes, group discussions) and summative assessments (assignments, project, final exam) to support ongoing learning and measure progress.
- All assessments are designed to align directly with the module's LOs for transparency and purpose.
- Feedback is provided regularly through verbal comments during lectures, written feedback on assignments, and peer review activities to enhance understanding and improvement.
- Group discussions encourage peer feedback and collaborative learning, building critical thinking and self-assessment skills.

Additional Information

Resit Procedure

Re-examination will consist entirely of exam.

Recommended Reading

1- Karsten Mangor, et al. ?Shoreline management guidelines?(DHI)ISBN:978-87-90634-04-9(freely available from: https://training.dhigroup.com/download-shoreline-management-guidelines/)
2- J William Kamphuis ?Introduction to Coastal Engineering and Management 2nd Edition?(world scientific) ISBN:978-981-283-484-3
3- Robert Sorensen ?Basic Coastal Engineering?(Springer)ISBN:978-1-4757-2665-7
4- Leo H Holthuijsen ?Waves in Oceanic and Coastal Waters?(Cambridge University Press), ISBN: 9780511618536

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Module Timetable

Week	Semester 1	Semester 2
0		
1		
2		
3		
4		
5		
6		
7		Submission 30%
8		
9		
10		
11		Submission 30%
E		Examination 40%

Date of Last Modification

06-11-2025