Subject Description Form

Subject Code	CSE585
Subject Title	Coastal Processes and Engineering under Climate Change
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Recommended background knowledge: Students should have a basic study background of mathematics, statistics, fluid mechanics and/or hydraulics at the undergraduate level.
Objectives	(i) To provide students the knowledge of the theory and practice of the main coastal processes and engineering, as well as the planning, design, and maintenance of works in coastal zones; (ii) To emphasize the adaptation of coastal engineering to climate change in short-term and long-term impacts.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Comprehend and quantify the major nearshore processes like wave transformation and breaking, nearshore circulation, sediment dynamics, and morphodynamics. b. Understand and interpret coastal systems on the basis of the underlying physical processes such as sea level dynamics, sediment budget, and the forcing by nearshore waves, currents and tides. Also assess the expected morphological response under natural or human-induced changes, which may affect one or more of the following drivers: mean sea levels, wave climate and other hydrodynamic processes, as well as sediment budget. c. Discuss the nature and complexity of problems a coastal engineer will face regarding coastal protection against flooding and erosion in view of climate change. d. Master the basic principles related to designing and evaluating methods for protection against flooding and erosion. e. Promote creative and critical thinking through undertaking individual assignment and team project.
Subject Synopsis/ Indicative Syllabus	**Keyword Syllabus** (i) Ocean and coastal waves Wind wave generation and dispersion, wave propagation and transformation (energy balance, shoaling, refraction, diffraction, wave-breaking), long-term statistics and extreme values, wave propagation models

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<u>(ii) Tides and currents</u>
Generation of the tide and current, equilibrium theory, main tidal harmonics, propagation of the tide, tidal analysis and prediction

<u>(iii) Nearshore circulation</u>
Wave-induced set-up and currents, cross-shore and alongshore balances

<u>(iv) Coastal morphodynamics</u>
Sediment transport, incipient motion, bed load transport, suspended load transport, longshore profile evolution, cross-shore profile evolution, numerical models for coastline evolution

<u>(v) Coastal structures and protection</u>
Strategies and methods, coastal structures, soft and hard solutions, nourishment, groins, submerged breakwaters, breakwaters, revetments

<u>(vi) Climate change, risk management and adaptation</u>
IPCC report, Sea Level Rise scenarios, coastal risk management, adaptation strategies
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<tr><td>Teaching/Learning Methodology</td><td>Fundamental knowledge will be covered in the lectures. Tutorials will provide opportunities for discussion of lecture materials and will also be conducted in the form of example class and problem-solving session to supplement understanding from lectures. Computer laboratory work will help students appreciate the basic principles and familiarize themselves with basic computer tools</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>1. Continuous Assessment</td><td>40%</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Written Examination</td><td>60%</td><td>√</td><td>√</td><td></td><td>√</td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="5"></td></tr>
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<tr><td></td><td colspan="2">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:
(1) Tutorials/assignments to exercise and strengthen the understanding of the principle and dynamics of coastal water systems;
(2) Computer-based laboratory work and report writing to work with critical thinking and shared activity;
(3) End-of-semester examination to work independently to analyze diverse problems with respect to coastal processes and engineering in Hong Kong.
Students must attain at least Grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result.</td></tr>
<tr><td rowspan="6">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures, Tutorials and Computer-based Laboratory</td><td>39 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading and study of reference materials</td><td>52 Hrs.</td></tr>
<tr><td>▪ Assignments and project reports</td><td>26 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>117 Hrs.</td></tr>
<tr><td>Reading List and References</td><td colspan="2">(1) Textbooks:
Dean R.G. & Darlymple R.A. (1991). “Water wave mechanics for engineers and scientists”, World Scientific.
Goda Y., 2010, “Random seas and design of maritime structures”, World Scientific.
Kamphuis J.W. (2010). “Introduction to coastal engineering and management”, World Scientific.
Komar P.D. (1998). “Beach Processes and Sedimentation”, Prentice Hall.
Zanuttigh B., Nicholls R., Vanderlinden J.P., Burcharth H.F., & Thompson R.C. (2014). “Coastal risk management in a changing climate”, Butterworth-Heinemann.
Bosboom J., & Stive M.J.F. (2021).” Coastal Dynamics”, TU Delft Open, ISBN (Electronic) 978-94-6366-371-7.
(2) Journals:
Nature – Climate Change; Nature – Communications; npj Climate and Atmospheric Science; Climate Dynamics; Journal of Climate; Coastal Engineering; Ocean Engineering; Ocean Modelling.</td></tr>
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