湖北工業大學
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Coastal and Offshore Engineering II: Structures, Sediment and Design
Course Code	GENG 5514
Semester	Spring 2027
Course Length	8 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite(s)	Successful completion of Coastal and Offshore Engineering I: Wave Mechanics and Hydrodynamics.
Antirequisite	GENG 5512 Coastal and Offshore Engineering II: Structures, Sediment and Design (4 Weeks)

Course Description:

This course is the second part of a two-part sequence in coastal and offshore engineering. Building on the wave mechanics and hydrodynamics established in the first course, it turns to the response of structures to wave loading, the hydrodynamic processes of the nearshore zone, the transport of coastal sediment, and the design of coastal and offshore structures.

The course integrates mechanics, sediment processes, and design practice. Students examine wave pressures on vertical and sloping structures, including the Goda wave pressure formulas, structural and dynamic response, foundations, wave setup, longshore and rip currents, tides and storm surge, surf-zone processes, the initiation of sediment motion, bedload and suspended load, cross-shore and longshore transport, and shoreline evolution. Each method is presented with its assumptions and its range of validity so that it can be applied with engineering judgement.

The course culminates in a design project. Working in teams, students complete the design of a coastal protection or offshore structure for a realistic setting, including loading, structural response, the sediment and shoreline context, structure selection, reliability and risk, and reference to established engineering guidance. The project is assessed through a written design report and an oral presentation.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical Thinking Skills** - Students will engage in analytical thinking, demonstrating the ability to critically evaluate, synthesize, and apply knowledge to complex problems, and construct well-reasoned solutions and arguments.
- **Independent Research and Inquiry** - Students will conduct independent research, utilizing academic resources to explore relevant topics, formulating research questions, analyzing data, and presenting findings in a coherent, scholarly manner.
- **Problem-Solving and Application** - Students will apply theoretical concepts and methodologies learned in the course to real-world problems, demonstrating the ability to develop practical solutions informed by academic inquiry.
- **Global and Cultural Awareness** - Students will gain awareness of the global and cultural contexts relevant to the course, appreciating diverse perspectives and considering the implications of their studies in a broader, international context.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

- Analyse the structural response of marine structures to wave loading.
- Apply wave pressure formulas, including the Goda method, to vertical and sloping structures.
- Describe nearshore hydrodynamic processes, including wave setup, longshore and rip currents, tides, and storm surge.
- Explain surf-zone processes and the use of numerical hydrodynamic modelling.
- Analyse sediment properties, initiation of motion, and bedload and suspended transport.
- Evaluate cross-shore and longshore sediment transport, shoreline change, and erosion.
- Design and manage coastal and offshore structures, including breakwaters, revetments, seawalls, reefs, pipelines, and subsea infrastructure.
- Work effectively in teams and communicate design results through reports and presentations.

Textbooks:

- Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press.
- Kamphuis, J. W. (2010). *Introduction to coastal engineering and management* (2nd ed.). World Scientific.
- Goda, Y. (2010). *Random seas and design of maritime structures* (3rd ed.). World Scientific.
- Sarpkaya, T., & Isaacson, M. (1981). *Mechanics of wave forces on offshore structures*. Van Nostrand Reinhold.
- Fredsøe, J., & Deigaard, R. (1992). *Mechanics of coastal sediment transport*. World Scientific.
- Komar, P. D. (1998). *Beach processes and sedimentation* (2nd ed.). Prentice Hall.
- US Army Corps of Engineers. *Coastal Engineering Manual*. Engineer Research and Development Center.

Course Requirements:

Assignment 1: Structural Response & Wave Pressure (15%)
Students will complete quantitative problems on the response of marine structures to wave loading and on wave pressures acting on vertical and sloping structures. Solutions must show the governing equations, full working, and correct units, and should apply the Goda formulas with appropriate engineering judgement.

Assignment 2: Nearshore Hydrodynamics & Sediment Transport (15%)
Students will solve problems on nearshore water levels and currents, surf-zone processes, the initiation of sediment motion, and bedload and suspended transport. The exercise tests the ability to connect hydrodynamic forcing with the movement of sediment.

Assignment 3: Coastal Structure Design Project (20%)
Working in teams, students will design a coastal protection or offshore structure for a realistic setting. The project should include:

- Site description and the design wave, water level, and environmental loads.
- Calculation of wave pressures and the resulting structural response.
- Assessment of the sediment and shoreline context, including erosion and transport.
- Selection of structure type and principal dimensions.
- Consideration of foundations, reliability, risk, and potential failure modes.
- Reference to established engineering guidance and design standards.
- A written design report and an oral presentation.

Final Examination (50%)
A closed-book examination covering structural response, wave pressures, nearshore hydrodynamics, sediment transport, shoreline evolution, and the design of coastal and offshore structures. The examination includes both conceptual questions and quantitative problems.

Assessments: Activity	**Percent Contribution**
Assignment 1: Structural Response & Wave Pressure	15%
Assignment 2: Nearshore Hydrodynamics & Sediment Transport	15%
Assignment 3: Coastal Structure Design Project	20%
Final Examination	50%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	**Percentage of available points**
A	94-100
A-	90-93
B+	87-89

B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:
The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

GENG 5514 Schedule		
Lecture	Topic	Readings
L1	Review of Part I and Structural Loading	Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press, Chapter 4.
L2	Structural Response to Wave Loading	Goda, Y. (2010). *Random seas and design of maritime structures* (3rd ed.). World Scientific, Chapter 1.
L3	Dynamic Effects and Marine Foundations	Sarpkaya, T., & Isaacson, M. (1981). *Mechanics of wave forces on offshore structures*. Van Nostrand Reinhold.
L4	Wave Pressures on Vertical and Sloping Structures	Goda, Y. (2010). *Random seas and design of maritime structures* (3rd ed.). World Scientific, Chapter 6.
L5	Goda Wave Pressure Formulas	Goda, Y. (2010). *Random seas and design of maritime structures* (3rd ed.). World Scientific, Chapter 6.
L6	Wave Forces on Walls and Caissons	Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press, Chapter 8.
L7	Wave Setup and Water Level Changes	Kamphuis, J. W. (2010). *Introduction to coastal engineering and management* (2nd ed.). World Scientific.
L8	Longshore Currents	Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press, Chapter 5.
L9	Rip Currents and Nearshore Circulation	Komar, P. D. (1998). *Beach processes and sedimentation* (2nd ed.). Prentice Hall.
L10	Tides, Storm Surge and Mean Sea Level	Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press, Chapter 3.
L11	Surf Zone Processes	Kamphuis, J. W. (2010). *Introduction to coastal engineering and management* (2nd ed.). World Scientific.

L12	Nearshore and Numerical Hydrodynamic Modelling	US Army Corps of Engineers. *Coastal Engineering Manual*. Engineer Research and Development Center.
L13	Sediment Properties and Initiation of Motion	Fredsøe, J., & Deigaard, R. (1992). *Mechanics of coastal sediment transport*. World Scientific, Chapters 1–2.
L14	Bedload and Suspended Load	Fredsøe, J., & Deigaard, R. (1992). *Mechanics of coastal sediment transport*. World Scientific, Chapters 3–4.
L15	Cross-Shore Transport and Profile Equilibrium	Komar, P. D. (1998). *Beach processes and sedimentation* (2nd ed.). Prentice Hall.
L16	Longshore Sediment Transport Rates	Kamphuis, J. W. (2010). *Introduction to coastal engineering and management* (2nd ed.). World Scientific.
L17	Littoral Cells and Beach Evolution	Komar, P. D. (1998). *Beach processes and sedimentation* (2nd ed.). Prentice Hall.
L18	Shoreline Change, Erosion and Nourishment	Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press, Chapter 6.
L19	Breakwaters and Revetments	Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press, Chapter 8.
L20	Seawalls and Coastal Protection Works	US Army Corps of Engineers. *Coastal Engineering Manual*. Engineer Research and Development Center.
L21	Design Reliability, Risk and Failure	Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press, Chapter 9.
L22	Artificial Reefs and Submarine Pipelines	Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press, Chapter 10.
L23	Subsea Infrastructure and Offshore Facilities	Sarpkaya, T., & Isaacson, M. (1981). *Mechanics of wave forces on offshore structures*. Van Nostrand Reinhold.
L24	Integrated Design Case Studies and Project Presentations	Reeve, D., Chadwick, A., & Fleming, C. (2018). *Coastal engineering: Processes, theory and design practice* (3rd ed.). CRC Press.
L25	Final Examination	Review all materials.

Accommodation Statement:

Academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow.

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations
All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process. This means that punctuality is a must, that cellular phones be turned off, and that courtesy is the guiding principle in all exchanges among students and faculty. You will be responsible for the materials and ideas presented in the lecture.

Assignment Due Dates
All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work
The instructor will not provide students with class information or make-up assignments/quizzes/exams missed due to an unexcused absence. Absences will be excused and assignments/quizzes/exams may be made up only with written documentation of an authorized absence. Every effort should be made to avoid scheduling appointments during class. An excused student is responsible for requesting any missed information from the instructor and setting up any necessary appointments outside of class.

Access, Special Needs, and Disabilities
Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.