Scour and Erosion in Coastal Environments

CGN 6905   Section STA1

Class Periods: TR, Periods 8-9, 3:00-4:55 PM (in-person sessions will by default be held on Thursdays)
Location: CSE E119 (WEIM 1092 only on Tuesdays and by special announcement) & Canvas
Academic Term: Spring 2024

Instructor:
Nina Stark
nina.stark@essie.ufl.edu
352-392-9537
Office Hours: Thursday, 1:30-2:30 PM, 265H Weil Hall or via zoom (Meeting ID: 236 384 8089)

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
N/A

Course Description
The course is designed as an introduction to scour and erosion processes relevant in coastal environments. Scour leads to most bridge failures and failures of coastal structures in the U.S., and thus, is an important topic to civil engineers. The course will give a background on the governing processes and theory, state-of-the-art scour assessment and prediction methods. It will address scour around different type of structures (piles, pipelines, breakwaters, etc.) in current and wave dominated areas. It will also address the topic of ship propeller scour in ports, and the impact of liquefaction on scour. Students will gain a solid knowledge of scour and erosion processes and will have the opportunity to apply scour and erosion assessment and prediction methods.
Course credit: 3

Course Pre-Requisites / Co-Requisites
Good graduate standing

Course Objectives
LO1: Students will understand the concepts of erosion and scour including forcing hydrodynamics and initiation of sediment transport.
On completion of the course, successful students will be able to:
L1) Assess critical shear stresses and likelihood of sediment erosion.
L2) Explain and depict the fluid flow response to the introduction of an object into a subaqueous environment.
L3) Identify and describe scour processes.

LO2: Students will be able to assess likelihood of scour and estimate the expected scour depth.
On completion of the course, successful students will be able to:
L4) Apply scour prediction and assessment approaches to different structures in coastal environments.
L5) Calculate expected scour depth.
L6) Evaluate 2D versus 3D scour.
L7) Assess the risk of ship propeller scour.

LO3: Students will understand potential impacts of sediment liquefaction on scour.
L8) Distinguish the processes of momentary and residual liquefaction.
L9) Evaluate the potential impact of liquefaction on scour.

Materials and Supply Fees
N/A

Required Textbooks and Software
Required reading materials will be provided through Canvas.

Recommended Materials

The lecture will be based on the book *The Mechanics of Scour in the Marine Environment* by B. Mutlu Sumer and J. Fredsoe. However, students are not required to have the book available. Further reading material will be suggested and made available during the course and in the Canvas website for this course.

Course Schedule
Week 1:   Introduction to this Course and Topic / Stark

Module 1: Introduction to Sediment Mobilization and Erosion
Week 2:   Sediment properties / Stark / Quiz 1
Week 3:   Initiation of motion and erosion rate / Stark / Quiz 2
Week 4:   Basic concepts of scour / Quiz 3/ Homework 1

Module 2: Scour around structures
Week 5:   Scour below pipelines / Stark /Quiz 4
Week 6:   Scour around piles / Stark / Quiz 5
Week 7:   Scour around breakwaters and seawalls / Stark / Quiz 6/ Homework 2

Module 3: Special considerations of scour and erosion
Week 8:   Ship propeller scour / Stark / Quiz8
Week 9:   Wave-driven Liquefaction in Marine Environments Part 1 / Stark / Quiz 9
Week 10:   Wave-driven Liquefaction in Marine Environments Part 2 / Stark / Quiz 10/Midterm exam

Module 4: Sediment dynamics in coastal environments
Week 11:   Cliffs / Stark / Quiz 11
Week 12:   Beaches / Stark / Quiz 12
Week 13:   Estuaries & deltas / Stark/ Quiz 13 /Homework 3
Week 14:   Summary & Q&A / Stark
Week 15:   Final project presentations / Class

Attendance Policy, Class Expectations, and Make-Up Policy
Key contents of this class are provided through videos and materials available on the class' Canvas site. To unlock the second and third module, you need to have passed all quizzes with at least 80%. Homework 1 needs to be submitted at latest two weeks after completing module 1 or by March 1 (whatever comes first). Homework 2 needs to be submitted at latest two weeks after completing module 1 or by March 15 (whatever comes first). The midterm project needs to be completed by March 31. The final exam will include individual projects to be presented in the final class session.

All key contents and graded work will be supplied via Canvas. In-person class is not mandatory but encouraged. In person session topics will be aligned with the weekly topics and include discussions, project work, and team work sessions. They will be held regularly on Thursdays 3-4:55PM in CSE E119. Changes to Tuesday may occur and will be announced. Mandatory attendance is required for the Thursday session in week 15 for final project presentations.

Students are required to see the instructor during office hours if their performance in graded work is under 80%. Students are encouraged to reach out to the instructor during office hours, via email, or after in-person session at any time.

If unexpected circumstances prohibit students to submit graded work within the submission windows, please contact the instructor as soon as you know about an extension. Late submissions are not accepted unless an extension has been granted. Late submissions without no extensions will lead to the removal of 25 points per day. If a student cannot attend the final presentation session in-person, please reach out to the instructor early on to discuss accommodations or this will be considered a late submission.

Students are encouraged to use laptops during in-person class session. In-person class sessions will not tolerate disruptive behavior. This may include anything that may disrupt other students from learning and includes cell phone calls and texting, etc.

Excused absences must be consistent with university policies in the Graduate Catalog (https://catalog.ufl.edu/graduate/regulations) and require appropriate documentation. Additional information can be found here: https://gradcatalog.ufl.edu/graduate/regulations/

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (3)	100 each	25%
Quizzes (13)	100 each	15%
Midterm Exam	100	30%
Final Project	100	30%
		100%

Grading Policy
The following is given as an example only.

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
UF Graduate Catalog
Grades and Grading Policies

Students Requiring Accommodations
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil

proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
• Your academic advisor or Graduate Program Coordinator
• Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:
<u>*Health and Wellness*</u>

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: https://counseling.ufl.edu, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

<u>*Academic Resources*</u>

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.ufl.edu.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints: *https://distance.ufl.edu/state-authorization-status/#student-complaint.*