Syllabus – Spring 2016

CE A476 and CE A676 Arctic Coastal Engineering (3 credits)

Description: Application of linear and non-linear wave theory to the study of coastal processes and design of coastal structures; wave transformation processes including wind generation, refraction, and diffraction. The course will emphasize unique Arctic coastal engineering challenges.

Stacked Course: The class includes undergraduate students enrolled in CE A476 and graduate students enrolled in CE A676. Undergrads are added as students on the CE A676 Blackboard site and we'll use this site for access to course materials and for course communications. All aspects of the course will be identical for the two groups with the exception of the research paper assigned to graduate students. Undergraduates will instead be assigned to submit technical reviews of papers submitted by graduate students. Guidelines for preparation and submittal of papers and of technical reviews will be separately provided.

Prerequisite: ES A341 Fluid Mechanics (or equivalent) with a grade of C or better

Instructor: Orson P. Smith, PE, Ph.D., D. CE[1], Professor Emeritus, UAA College of Engineering
opsmith@uaa.alaska.edu; 907-632-0343 [responses within 24 hours, usually faster]

Office Hours: I will be available for consultations with students from 8 – 10 am on Mondays and Wednesdays by phone or, if preferred, using Collaborate or Skype. Appointments can be made at other times.

Text: Sorensen, Robert M., 2006. Basic Coastal Engineering, 3rd ed., Springer, London

- Available at UAA campus bookstore (Anchorage)
- Available from Springer: hardcover, softcover, or ebook (pdf); ISBN 978-0-387-23333-8 http://www.springer.com/us/book/9780387233321#otherversion=9780387233338
- 2nd edition is available from Amazon and other online sellers; some features of 3rd ed. are missing, but wave mechanics materials are identical; 3rd ed. recommended

- The Coastal Engineering Manual, available free online (http://chl.erdc.usace.army.mil/cem), will also be extensively referenced
- Other references and a useful bibliography will be provided separately

Distance Delivery: The course will occur via online communications. The typical weekly sequence of student activities will be:

1. Review assigned reading in text and other references.
2. Review online narrated presentations, videos, and other assigned materials.

[1] Diplomate, Coastal Engineering, Academy of Coastal, Ocean, Port, and Navigation Engineers

3. Answer challenge questions related to above. These will be discussed in subsequent meetings.
4. Complete an online quiz associated with current challenge questions will precede each meeting.
5. Participate in 1-hour weekly online meeting via Blackboard Collaborate to discuss challenge questions and other matters related to current topics and homework assignments. Collaborate meetings will be recorded and posted.
    a. With permission in advance, students may miss up to 2 Collaborate sessions, but must then listen to the session recording and submit evidence of understanding discussions.

Homework will be submitted by email. Quizzes and timed mid-term (3 hours) and final (4.5 hours) exams will take place via Blackboard. Quizzes will allow multiple attempts before a scheduled deadline. Exams will allow only a single attempt on the scheduled exam day.

Blackboard Collaborate meetings:

Live online meetings will occur each week of the course from 7 – 8pm. Students should sign on before the hour. The site will generally be available 15 minutes early. See "Getting Started" below for guidance on preparing to use Collaborate. The Blackboard website offers how-to instructions and video tutorials. Students are expected to have completed all the reading, have viewed all presentations and videos, and have completed the weekly quiz.

Assignments:

Homework assignments will include computations, sometimes involving data retrieval from public sources, that are too time-consuming for exam periods. Homework should not be left to the last minute. Work should be presented in a professional manner, with a heading including course title, student's name, assignment number, and due date. Assigned questions should be written before the student's answer. Assumptions should be stated and outside references and data sources cited. Assignments submitted up to one week after the due date, without specific permission of the instructor, will have their scores reduced 15 percent. No submittals will be accepted beyond one week after the due date. Electronic submittals of homework should be contained in *a single printable file* as an email attachment to the instructor, preferably in pdf format. The subject of email submittals should identify the student, the course, and the assignment.

Grading:

The course grade will be based on the following: Average quiz score (5%), participation in Collaborate meetings (5%), average homework score (25%), mid-term score (25%), technical paper (CE A676 10%), technical paper reviews (CE A476 10%), comprehensive final exam score (30%). Letter grades will follow the scale A: 100-90, B: 89-80, C: 79-70, D: 69-60, and F: below 60, with regard to the course score compiled as above.

Getting Started:

1. Make sure you can access the course on Blackboard (https://blackboard.uaa.alaska.edu) and view all materials provided.
    a. Assistance is available from UAA Information Technology Services (ITS) (https://www.uaa.alaska.edu/about/administrative-services/departments/information-technology-services/)
2. Make sure you have downloaded and installed Blackboard Collaborate
    a. ITS help is also available for this.

   b. Most computers have built-in speakers and microphones. Separate mics and speakers can be purchased, if needed to participate in Collaborate sessions.
3. Consider if you need to use UAA Disability Support Services (https://www.uaa.alaska.edu/dss/)
4. Review the Student Code of Conduct, particularly terms related to academic integrity (https://www.uaa.alaska.edu/deanofstudents/studentconduct/code.cfm)

Instructional Goals:

- Describe the terminology used in the field of coastal engineering
- Introduce linear and non-linear wave theory and show how it is applied
- Describe important wave transformation processes including wind generation, refraction, and diffraction
- Introduce shallow water equations and show how they can be applied to understand coastal water level fluctuations
- Describe the coastal processes that are relevant to the coastal engineer
- Present methods for the design of coastal structures and provide opportunities for students to apply these methods

Learning Outcomes - Students successfully completing the course will have ability to:

- Describe coastal features, coastal processes, and coastal engineering works
- Explain the theoretical underpinnings of linear and non-linear wave theory
- Quantify wave transformation processes
- Apply shallow water equations to calculate coastal water level fluctuations including storm surges
- Design coastal structures or beach nourishment projects to safeguard coastal infrastructure and to protect against coastal erosion
- Quantify the major coastal processes such as longshore sediment transport
- Demonstrate mastery of some aspect of coastal engineering and design

CE A476/676 Coastal Engineering – Spring 2016 Schedule

2016 Week of	Module	Topic	Text[2] reading assigned	CEM[3] reading recommended	Due Dates[4]
Jan 11	1	Coastal engineering overview; Arctic challenges (video)	Ch. 1	Part I Ch.2-3	1/14 7 pm quiz 1
Jan 18	2	Sinusoidal waves 1	Ch. 2	Part II Ch. 1	1/21 7 pm quiz 2
Jan 25	3	Sinusoidal waves 2	Ch. 2	II Ch. 1	1/28 7 pm quiz 3; 1/31: Hmwk 1
Feb 1	4	Finite amplitude waves	Ch. 3	II Ch. 1	2/4 7 pm quiz 4
Feb 8	5	Wave transformations	Ch. 4	II Ch. 3, 7	2/11 7 pm quiz 5; 2/14: Hmwk 2
Feb 15	6	Tides, storm surge, sea level change	Ch. 5	II Ch. 5	2/18 7 pm quiz 6; 2/21: 676 paper topics
Feb 22	7	Sea State Analysis	Ch. 6	II Ch. 2	2/25 7 pm quiz 7; 2/28: Hmwk 3
Feb 29	8	Arctic weather and sea conditions (video presentation)			3/3 7 pm quiz 8
Mar 7		Mid-term Exam (3 hours; available any time on 3/10/16)			3/10 2359 mid-term exam
Mar 14		Spring break			
Mar 21	9	Coastal Processes 1 - longshore & cross-shore transport	Ch. 8	II Ch.4, III Ch.1-3	3/24 7 pm quiz 9
Mar 28	10	Coastal Processes 2 - sediment budgets…	Ch. 8	IV Ch.1-3,V Ch.2-3	3/31 7 pm quiz 10; 4/3: Hmwk 4
Apr 4	11	Coastal Structures 1 – revetments; sea walls	Ch. 7	V Ch. 3	4/7 7 pm quiz 11; 4/10: 676 papers
Apr 11	12	Coastal Structures 2 - groins; breakwaters; beach fill	Ch. 7	V Ch. 3-5	4/14 7 pm quiz 12; 4/17: Hmwk 5
Apr 18	13	Coastal Structures 3 – ice forces, Arctic considerations (video presentation)			4/21 7 pm quiz 13; 4/22: 476 paper reviews
Apr 25		Comprehensive Final Exam (4.5 hours; available 4/28/16			4/28 2359 final exam

[2] Sorensen, R., Basic Coastal Engineering, 3rd ed., Springer
[3] Coastal Engineering Manual (http://chl.erdc.usace.army.mil/cem)
[4] Homework is due before 11:59 pm Alaska time