TEXAS A&M UNIVERSITY

SYLLABUS

Course title and number	OCEN 689: Nature-Based Elements of Engineered Coastal Systems
Term (e.g., Fall 200X)	Fall 2019
Meeting times and location	Tuesday-Thursday 2:20–3:35, PMEC Room 146, Galveston

Course Description and Prerequisites

Engineering design applications and outcomes for individual elements of natural marine processes, including coastal and marine plants and oyster reefs; bio-chemical, hydraulic and sediment structures necessary for success of these elements; the focus of the course is on the selection of individual elements to meet specific objectives on relatively small spatial- and temporal-scales. Prerequisites include OCEN 300 (Ocean Engineering Wave Mechanics), OCEN 311 (Fluid Statics and Dynamics), or equivalent courses pre-Approved by the instructor.

Learning Outcomes or Course Objectives

The primary goal for the course is for students to develop the technical knowledge necessary to specify individual elements of nature-based systems that will enhance a specified infrastructure, and to be able to quantify in engineering terms the short-term effects of these elements. The intent is that by the end of the course, students will be able to:

• compute the engineering properties of existing natural features at a specified location;
• specify appropriate nature-based elements that will attain specific short-term engineering outcomes;
• identify nature-based elements (plants and animals) likely to be self-sustaining within a specified environmental infrastructure, including consideration of typical and extreme-event conditions;
• apply existing biologic data in a design-engineering context;
• quantify the competing short-term design trade-offs of nature-based feature selection at the individual element level;
• demonstrate the capability to effectively communicate quantitative design engineering values to scientists in fields such as biology and ecology, and to effectively communicate the engineering concepts to the general public.

Instructor Information

Name	Bert Sweetman PhD, PE
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Email address	bert.sweetman@tamu.edu
Office hours	Monday and Wednesday: 1:20–3:50
Office location	PMEC Room 216, Galveston

Textbook and/or Resource Material

Course material and related references will be provided each week.
Recommended: *Use of Vegetation in Civil Engineering*, N.J. Coppin, I.G. Richards, Butterworth-Heinemann, 1990. ISBN-10: 0408038497
Field Guide to Coastal Wetland Plants of the Southeastern United States, R.W. Tiner, A. Rover, University of Massachusetts Press, 1993. ISBN-10: 0870238337
Reference: *Aquatic and Wetland Plants of the Western Gulf Coast*, C.D. Stutzenbaker, Texas A&M University Press, 2010. ISBN-10: 1603442227
Tidal Wetlands Primer, R.W. Tiner, University of Massachusetts Press, 2013.ISBN-10: 1625340222
The Coastal Zone: Past, Present and Future, F.J. Vernberg and W.B. Vernberg, University of South Carolina Press, 2001. ISBN-10: 1570033943

Grading Policies

Homework:	10%
Exam 1:	30%
Exam 2:	30%
Final Exam:	30%
Total:	100%

Grading Scale

Standard Letter Grading Scale:
90% ≤ A
75% ≤ B < 90%
60% ≤ C < 75%
50% ≤ D < 60%
F < 50%

Course Topics, Calendar of Activities, Major Assignment Dates

Week	Topic
1	Introduction to wetlands, functions, basic components, natural vs engineered systems, field trip to observe local marsh;
2	Elements of the upland edge of wetlands – erosion control (maritime forests - swamp trees and shrubs), water quality (levees, storm gates, sills, groins/ breakwaters, plants and salinity, indicator status of plants);
3	Elements on vegetated tidal flats – plants and their biogeochemisty (nutrient cycling and pollution, role of plants in controlling toxic runoff), soils(shallow), roads, culverts;
4	Elements over open water sections of tidal flats – lagoons, channels, estuaries (boundary conditions, monitoring), Extended biological elements – habitats, fish

5	Elements of the wetland interior – flow resistance provided by plants and associated computations, engineering properties of plants and relation to flow resistance (axial and flexural responses, elasticity, density) sediment trapping and its relation to plant structure;
6	Selection of elements for wetland interior - selection and arrangement of plants based on design properties and viability: impact of abiotic boundary conditions - temperature, tides, submergence time, light, substratum;
7	Other biotic elements in the interior - Fish and wildlife benefits, relation to interior water levels, food availability, impact on plant communities;
8	Functional elements of the wetland salt edge (marsh side) – prevention of erosion (coastal soil types and their impact, role of plants in erosion reduction);
9	Functional requirements of the wetland salt edge (bay side) – wave-vegetation interaction (bioengineering properties of plants impacting wave attenuation), structural interventions for hydrologic modification;
10	Elements of the wetland salt edge (bay side) – role of oyster reefs in wave attenuation (properties, species and boundary conditions, effect on sediment transport, nutrient filtration);
11	Construction of oyster reefs – reef balls/shell bags, spacing between zones, self-sustainability and monitoring; recovery after extreme events;
12	Elements of coastal dunes and related upland structures – elements influencing Aeolian processes (coastal sediment types, sand fences, dune cross over structures, introduction to upland plants);
13	Elements of coastal dunes and related upland structures – maintaining slope stability using vegetation (roots and root systems of plants and their interaction with the surroundings);
14	Beach nourishment and thin layer placement; Beach-dune habitat restoration for native wildlife

Other Pertinent Course Information

TAMU Student Rules are posted at http://student-rules.tamu.edu. Any issue not addressed explicitly in this syllabus will be governed by the Student Rules. Much of the course material has been compiled from primary-source and/or non-engineering documents, and may not be broadly available. Attendance in lecture will generally be necessary to master the course material. Two types of registration are available for this course: in-person and online. Students local to Galveston are expected to register in-person; in-person registrants are expected to appear in class (not online), unless they have received pre-approval of the instructor. Students registered in-person may be blocked from remote attendance.

Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

Academic Integrity

For additional information please visit: http://aggiehonor.tamu.edu

"An Aggie does not lie, cheat, or steal, or tolerate those who do."

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. Students are expected to understand and abide by the Aggie Honor Code. No form of scholastic misconduct will be tolerated. Academic misconduct includes cheating, fabrication, falsification, multiple submissions, plagiarism, complicity, etc. These are more fully defined in the above web site. Violations will be handled in accordance with the Aggie Honor System Process described on the web site. Students will be required to write and sign the following on examinations: "On my honor, as an Aggie, I have neither given nor received unauthorized aid on this exam."