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Teaching Assistant: Nicole Nakata (nnakata@uoregon.edu)
Office: Tyler Research Building, OIMB  campus phone ext: 213 (Emlet lab)

OFFICE HOURS:  R Emlet – please come by anytime; we’ll talk immediately, or we can schedule a time.
N Nakata – same as for Emlet

DESCRIPTION OF COURSE
Estuaries are complex aquatic ecosystems situated at the interface with the coastal ocean and the terrestrial environment. Through a combination of lectures, field trips, and field and laboratory exercises, students will learn about various habitats and components of these biologically rich systems. Lectures will cover a broad range of topics on how estuaries function physically and biologically and their importance to living organisms including humans. Factors that control the abundance, distribution, production, and diversity within estuarine habitats will be identified and explored. Field trips to various habitats will let students see and sample patterns of abundance and diversity. Field and laboratory work will teach students how organisms work, how they modify their environments and interact with other organisms. Organism identification, methods for sampling and quantifying patterns, and preparation of data will also be parts of field and laboratory exercises. Student presentations on world estuaries will be an opportunity for the class to learn about other estuaries – how they work, how they are used, and what their current state is.

This course is taught at the Oregon Institute of Marine Biology in Charleston Oregon. Each week it meets for one full day.

COURSE GOALS/LEARNING OUTCOMES
Student will:
- Become proficient in describing the various estuarine habitats, in explaining physical and biological factors in those habitats that influence the abundance and distribution of organisms, and in understanding energy flows in and between estuarine environments.
- Explore first hand the superb estuarine habitats, including salt marshes, intertidal sand and mud flats, and subtidal regions that are particularly well represented in the Charleston/Coos Bay, Oregon coastal region.
- Use the tools of research ecologists; analyze population variability and quantify abundance and distribution of organisms in different habitats.
- Learn about estuaries around the world and some of their challenges both common and unique.

REQUIRED READING for the course:
No required texts; there are reference books in the back of the classroom and I may recommend readings during lectures.

FIELD TRIPS AND RECOMMENDED ATTIRE
- We will take a number of field trips in this course. Many will involve intertidal exploration, others will be aboard small and medium sized OIMB vessels.
- You should have a good pair of (knee-high) GUM BOOTS or a pair of HIP-WADERS
- Old and warm clothing is recommended for field trips.
- RAIN GEAR is also recommended, we will be working low tides when it may be raining (this is Oregon).
- Laboratory equipment will be supplied, but if you have a dissecting kit bring it along to lab. Also bring your calculator.
- FIELD NOTEBOOK -taking notes on field trips & in lab is strongly recommended. This will help you carry out the assigned work and should be reviewed in preparation for exams.

ANTICIPATED SCHEDULE OF INSTRUCTIONAL TOPICS BY WEEK
See the attached Course Schedule for Fall 2017.

Basis for Undergraduate Grading:
Organism quiz (wk 5) 50 points
Midterm (wk 6) 100 points
Final exam (wk 11) 100 points
Lab/Field work 125 points
Estuarine Presentation 75 points
TOTAL: 450 points

EXAMINATIONS -
- An Organisms Quiz will be given on week 5 as a tool to get students to learn names and be able to identify some important members of estuarine habitats.
- MIDTERM I about 1.5 hours long will be given during week 6. The midterm will cover lectures, labs and discussions for Weeks 1 through 5.
- FINAL EXAM will be cumulative and also cover lecture, lab and discussion materials. A sample exam will be made available before the Final.
- Midterm I scores will be replaced by the FINAL EXAM score if the latter is better.

OTHER WORK
- The lab and fieldwork component of the grade will be based on participation in these parts of class AND on individual or small group assignments that will be collected and graded.
- Estuarine Presentation - In order for the class to learn more broadly about similarities and differences, I have compiled a list of estuaries from which I would like pairs of students to choose and then prepare presentation – see description below.
- Missed work must be made up in a timely fashion that both student and instructor agree on. Many of the class assignments will be group efforts, so it is important that you contribute to your groups effort and not delay their work.
- Scores for all parts of the course will be available to students who wish to discuss their performance.

STUDENT WORKLOAD EXPECTATIONS
- Students are expected to come to class and participate in the lectures, field trips and laboratory exercises. Promptness is both expected and appreciated. I strongly encourage you to read about topics discussed in lecture by using the reference collection or the OIMB/UO library. While there is no required textbook, students are expected to be able to access cited references on reserve or through resources of the OIMB Rippey Library. Please do not remove reference books for more than 1 day and sign them out.
- Some field and laboratory assignments will require students to work up data and prepare graphs or statistical analyses. To the extent these are not completed during class times, students will be responsible for completion of the work outside of class. Work will be collected after class or a reasonable interval and evaluated.

DIFFERENTIATION OF GRADUATE VS UNDERGRADUATE WORKLOAD
For undergraduate credit the course will consist of the exams and the grading scheme described above. However, undergraduates have the option of choosing a modified graduate student scheme. Instead of testing undergraduates can choose to write 2 term papers in lieu of midterm and final exams. These will be evaluated and graded according to the scheme for graduate students. Once the first midterm has been given, the choice of grading scheme cannot be changed. Papers are due on Monday Oct 29 and Monday Nov 26, 2018.

For graduate students, 2 literature-based research papers (approx. 10 typed pages, double-spaced) will be assigned in lieu of the midterm and final. A description of the Research paper is attached. Each paper will be critically read and marked by the instructor and graded for content, style, and grammar. Then the paper will be returned to the student for a complete rewrite. The paper will then be re-graded. This write/rewrite scheme is meant to give (graduate) students critical feedback and an opportunity to improve writing skills. Graduate students will still be required to take the Organism Quiz (week 5), make an Estuarine Presentation and participate fully in lab and discussion. The 200 points normally assigned to the Midterm and Final will be split equally into 2 parts, one part for each paper.

For students with disabilities:
The University of Oregon is working to create inclusive learning environments. Please notify me [Emlet] if there are aspects of the instruction or design of this course that result in barriers to your participation. You may also wish to contact Disability Services (164 Oregon Hall) at 541-346-1155 or disabsrv@uoregon.edu.
ESTUARINE BIOLOGY (BI 454/554, 5 credits)  Fall 2017 – ver: 9-26-2018
Class Schedule:  Tuesdays, 0830 - 1700  *See exceptions below (including 2 Thursdays)*

Week 1 Introduction to estuaries and benthic organisms
*Sept  27 (Thursday) 08:05 PDT HLow +1.34 ft
*7:30 Field trip to Portside mudflat to collect infaunal invertebrates
10:30 Lecture: Introduction to the class, goals.
11:00 Lecture: Overview of estuaries – importance, distribution in space and time.
12:00 lunch
13:15 Set up aquaria with mud and animals – seed aquaria for animal/sediment interactions.
15:30 Charleston Harbor settlement studies--- Discuss, plan, set-up, and design fouling plate studies… Prepare settlement plates to be deployed.

Week 2 Physical properties of an estuary
Oct  2 07:02 PDT LHigh +5.65ft, 07:16 PDT Sunrise; 12:06 PDT HLow +3.4ft 18:09 PDT +6.98ft HHigh
08:30 Lecture: Types of estuaries and circulation, sedimentation
10:00 Field trip: Boat trip up Coos Estuary – sampling stations for temp, salinity, sediments, etc
  Group 1 depart in boat at 10:00 am - sample lower estuary and Isthmus slough; disembark at Town dock ca. 11:50am (home 12:15ish)
  Group 2 meet at 11:30 at van, drive to exchange site Town dock 12:00 – sample upper estuary and Coos River, back at Forks at 13:15 (home 14:00ish)
  Group 3 meet at 12:45 at van, drive to exchange site Forks 13:30 – sample upper estuary and lower estuary – back to Charleston 16:00ish
(Groups not on boat – construct and deploy the settlement plates in the patterns we discussed last week.

Week 3 – Estuarine gradients - ecotones
Oct  9 06:48 PDT LLow +0.38ft; 13:00 PDT HHigh +8.35 feet
*08:00 short Field Trip to Metcalf – look see low tide
08:45 Lecture: Estuarine gradients, +/- oxygen, other physical characteristics
10:00 Lecture: Tides
11:00 start to work up data from cruise. Reweigh sediment samples
12:00 Lunch
13:15 very short Field Trip to Metcalf – look see high tide
  continue working up estuarine data
15:00 Field trip: TBA or South Slough Hidden Creek Marsh – salinity and O₂ measurements

Week 4 Saltmarshes
*Oct 18 Thursday 14:12 PDT LLow +1.34ft
08:30 Lecture: Salt Marshes
10:00 Lecture: Mangroves - replacement of salt-marsh in the tropics
12:00 Lunch
13:15 Fieldtrip to Metcalf Marsh, plant identification, quantitative transects
16:00 Initial laboratory work up field samples (weigh and dry plant and sediment samples)
Week 5 The estuarine environment and boundary layers
Oct 23 12:01 PDT HHigh +7.83ft; 18:24 PDT LLow +0.65ft
08:30 Estuarine Organism Quiz (on mudflat, fouling and saltmarsh organisms)
09:00 Lecture on boundary layers
10:30 Field trip to examine boundary layers
12:00 Lunch
13:15 Lecture - TBA
14:30 Work up boundary layer data and salt marsh drying sample weights
15:30 computer lab on boundary layers

Week 6 Benthic Communities
Oct 30 05:41 PDT LHigh +6.2ft; 10:51 PDT HLlow +3.47ft
08:30 Midterm Exam I
10:30 Laboratory - weigh sediment and plant samples
11:00 Lecture: Estuarine animals & infaunal community interactions I.
12:00 Lunch
13:15 Field trip: TBA – South Slough Hidden Creek Marsh – salinity and O2 measurements
16:00 World Estuary Presentations (I & II)

Week 7 More on Benthic Communities
Nov 6 10:50 PST HHigh +8.47ft; 17:24 PST LLow -0.38ft
08:30 Lecture: Infaunal community interactions II.
10:00 process salt marsh samples
12:00 Lunch
13:15 – continue morning lab
14:30 Lecture: Infaunal community interactions III.
15:30 Field trip to Dome House sand flat for quantitative sampling of infauna.

Week 8 Seagrasses, Phytoplankton and Detritus Estuarine
Nov 13 09:38 PST HLow +3.94ft
08:30 Lecture: Seagrass communities, importance & ecology
10:00 Lecture: Estuarine production, detritus and energy flows
11:00 Work up samples/data from quantitative field trip continue lab work of mudflat or saltmarsh data
Sort gravel/shell hash, identify different species, measure juveniles and adult butter clams (others too?) Construct size frequency plots; attempt to age the butter clams.
12:00 Lunch
13:15 continue lab or TBA
15:30 Presentations on World Estuaries (III, IV & V)

Week 9 Sediments and Anoxia
Nov 20 16:21 PST LLow +0.7ft
08:30 Lecture: Decomposition, sediment chemistry and biogeochemical cycling
10:00 Field trip trawling on "RV PLUTEUS" to collect subtidal organisms of the Coos estuary
12:00 Lunch
13:15 Look at and key out organisms collected on dredge trip.
15:30 Presentations on World Estuaries (VI & VII)

**Week 10  Fouling Communities and Negative Estuaries**

Nov 27  08:43 PST HLow +3.3ft
08:30  Lecture: Fouling communities and Introduced Species
**10:00  Examine fouling plate experiments and evaluate patterns**
12:00 Lunch
13:15  Lecture: Negative estuaries and other topics TBA
14:00 Settlement plate presentations
15:30 Lab clean up

**Dec 4  Final Exam is Tuesday of exam week: 8:30 to 10:30 am in classroom.**