MSCI 478/478L
Marine Invertebrate Zoology

Fall 2023. **LECTURE** = T, TR: 8-9:15, EHFA 245
LAB = **478L-01**: F 11:30-2:20, SCI2 125; **PRE-LAB BRIEFING**: SCI2 225 @ 11:30

Instructor: Dr. Juliana Harding Office: SCI2 226
Email: jharding@coastal.edu

Office Hours: Virtual meetings: Monday (12:30-2:30), Tuesday (9:45-11:45), Wednesday (10-12) or by appointment.
These are open, drop-in sessions hosted on Zoom.
Link = https://ccuchants.zoom.us/j/3355584867; Meeting ID: 335 558 4867

Webpage: Moodle course management system. Course materials including the syllabus, taxonomic outlines, vocabulary lists, and supplemental readings will be posted to Moodle.

Text: Required: Pechenik, J. 2015. *Biology of the Invertebrates, 7th edition*.
Required: *MSCI 478 Laboratory Manual*, J.M. Harding (available on course Moodle page).
Recommended: Clouse, R. 2016. A basic glossary of invertebrate zoology. Counselor Books, LLC. 184 p.

Pre-requisites: A grade of C or better in MSCI 302 and MSCI 302L or BIOL 370 and BIOL 370L (MSCI 478 lab and lecture are co-requisites).

CATALOG DESCRIPTION: A comprehensive survey of the functional biology, morphology, life history, ecology, and relationships between marine invertebrate taxa. The focus will be on the Porifera, Cnidaria, Ctenophora, Platyhelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, and invertebrate members of Chordata. Global issues related to invertebrates and their roles in food webs, fisheries, and aquaculture will also be discussed. Three lecture hours and three laboratory hours per week.

OBJECTIVES: Upon completion of this course, students should have a thorough understanding of the structure, functional morphology, and ecology of marine invertebrates, including the various groups, their classification, anatomy and physiology, sensory biology, feeding and energetics, social and reproductive behavior, and life history. Students should be able to interpret and discuss current research in marine invertebrate zoology and be able to make informed decisions about related management, policy and social issues.

STUDENT LEARNING OUTCOMES: Upon the completion of this lecture and laboratory, students should be able to:

1. Identify the major taxonomic groups of marine invertebrates and their diagnostic characteristics, from the family level and above, and identify selected species of importance.
2. Compare the structure and function of the major anatomical and physiological systems between major groups of marine invertebrates, with specific attention to musculoskeletal systems, locomotion, reproduction, and sensory biology as well as adaptations for living in various marine and estuarine habitats.
3. Describe and discuss the ecological roles of marine invertebrates across major ecosystems with specific examples of impacts on trophic structure, bioenergetics, and biogenic structure.

4. Identify the larval form that corresponds to a given adult for each phylum or class and understand the major larval development modes, how they differ, and consequences of each for a taxon.
5. Complete basic production and bioenergetic calculations to quantify the importance of selected marine invertebrate taxa within their communities.
6. Relate marine invertebrate reproductive strategies to ambient seasonal, environmental, and oceanographic conditions and explain how these factors interact to affect the persistence of a species within selected habitats in the context of examples from current literature.
7. Produce original accurate drawings of representative specimens and record personal observations of live animal behavior in a detailed scientific manner.

EXPECTATIONS: This is a 400 level specialty course. The effort that must be applied to earn a grade of C or better in this 400 level course is substantially greater than the effort for C in a 100 level course. I expect that you 1) already have the ability to take notes, pay attention in class, and synthesize your notes with textbook and laboratory material/experiences, 2) have the internal motivation to learn and synthesize the material, and 3) will be actively involved in lecture and laboratory throughout the term. I also expect that you have a reasonable command of the English language and care enough about your performance to proof-read any and all submissions. I reserve the right to return any assignment with excessive grammar, punctuation, and/or spelling errors with a grade of 0.

Students are expected to have mastered the concepts covered in the pre-requisite courses including (but not limited to) the Linnaean taxonomic system, relevance and use of primary diagnostic characters, and the primary phyletic diagnostic characters associated with the major animal phyla including Porifera, Cnidaria, Ctenophora, Platyhelminthes, Annelida, Nematoda, Mollusca, Arthropoda, Echinodermata, and Chordata. This 400 level course builds on these foundation concepts.

GRADING POLICY: The lecture and laboratory are separate co-requisite courses (3 credits and 1 credit), and you do receive a grade for each, but in practice, a single overall grade will be based on both the lecture and laboratory combined (you earn the same grade for both classes). Your grade is based on 4 essay tests during the semester (including the cumulative final exam), quizzes, attendance, homework assignments, participation in lecture and laboratory, and laboratory activities (discussed below). The course point allocation is:

3 Lecture tests and a comprehensive final exam (16% each, except the lowest grade which is worth 7%)	55 %
Laboratory grade (described below)	40 %
Attendance, homework assignments, & participation	5 %

- Grading scale: A (≥90), B+ (88.0-89.9), B (80.0-87.9), C+ (78.0-79.9), C (70-77.9), D+(68-69.9), D (60-67.9), F (0-59.9).
- There are no make-up assignments without a University-excused absence or with permission ahead of time. Quizzes will be administered on Moodle.
- Tests will be on topics covered in the book, lecture, and laboratory. Many topics will be discussed in lecture that are not in your book, so daily attendance is essential to a passing grade in this course. **Lecture tests include only essay questions**. A cumulative final exam will be given during the scheduled University exam week in the block assigned by the University Registrar (https://www.coastal.edu/registrar/examschedule/finalexamschedules/fall2023/).

- **Vocabulary.** The field of Marine Invertebrate Zoology uses a unique and voluminous vocabulary. The textbook typically provides definitions of relevant terms/names when they are first used. I will provide definitions when I first use a term in lecture or lab. Each lab description/overview within the lab manual includes a set of relevant vocabulary terms. **Students are responsible for mastery of all relevant terms**.

  What does "mastery" mean? **Mastery** means that a student can **define** a word correctly, accurately **label** the related morphological feature(s) on a diagram or actual specimen, and **apply** the word by **synthetically** incorporating it into detailed descriptions of form and function.

  Every lab and lecture are essentially a vocabulary "quiz" because I will use the terminology as professionals do and ***I expect you to be able to do the same*** in conversation, writing, articulation of questions, and, especially, labeling of lab notebook diagrams. Familiarity with and use of the extensive vocabulary associated with the field is a fundamental part of student training in Marine Invertebrate Zoology. Please take care to avoid the pitfall of substituting jargon, made-up terms, or hand motions for the actual terms. These habits are very hard to break once started.
- I reserve the right to return assignments that include incomplete sentences, grammar mistakes, and/or excessive punctuation mistakes without assigning a grade.
- Late lecture assignments will be penalized 25% and must be turned in at or before the beginning of the next business day after the due date for grading consideration. Late lab assignments will be penalized 25% and must be turned in before noon on the next business day after the due date for grading consideration. Please contact me ASAP if an assignment will be late for reasons related to a CCU approved excused absence.
- The laboratory is worth 40% of your combined lecture/lab grade. Laboratory grades are based on weekly pre-lab quizzes (12 total, 11 considered for the grade (see below), which cumulatively are 10% of the total grade), 4 practical exams (each is 6% of the total grade, cumulatively, 24% of the total grade), and a graded laboratory notebook (6% of the total grade). You must pass the laboratory to pass the course. Information from the laboratories can and will be included in lecture tests. Information from lecture tests is fair game on the lab practical exams.
  - **Lab practical exams**: *One of the four lab practical exams will be an evening exam that is outside the normal class time slot.* ***Students are responsible for checking their schedules for other classes and making Dr. Harding aware of any potential class conflicts at least 2 weeks before the scheduled date.*** The evening practical date will be announced on the first day of lecture, included in the syllabus, and discussed during the first lab so that students can plan accordingly.
  - **Weekly pre-lab quizzes**: Students are required to complete a quiz via Moodle every week before lab. Quizzes are taken by individual students with no use of outside sources including other students. Each week, the Moodle quiz will open on Thursday at 10 am and close on Friday at 10:59 am. Each quiz will include 10-20 questions related to lab material for that week. The quizzes are timed with approximately 1 minute planned for each question. When the allotted time expires, the quiz will automatically close. The quiz must be completed once started; i.e., the quiz cannot be saved and returned to at a later time. Questions must be answered when they are first encountered meaning that you will not be able to scroll back through the quiz to answer a question or change an answer. *The lowest pre-lab quiz grade will be dropped* (= not considered in the final calculation for your average pre-lab quiz score).
  - **Graded laboratory (lab) notebook**: Every student is required to produce an original laboratory notebook that contains a complete record of all lab-related work during the semester. This notebook should be a spiral notebook or a bound composition notebook. Artist's sketchbooks are acceptable. Lab notebooks will be checked and graded at least 3 times during the semester as described on the course schedule. If a student chooses to use the same notebook for lecture as well as lab notes, lecture and lab material must be clearly distinguished by labeled tabs at the top or right side of the

pages. Detailed lab notebook guidelines are provided in the course lab manual on Moodle. At minimum, the lab notebook will include:

- ***Contact information***: Student contact information (at least: name, phone number, email, lab section) should be written inside the front cover or on the first page of the notebook.
- ***Specimen pages:*** Specimen pages will be formatted using these guidelines. Every page in the notebook will have a header (= top of the page) consisting of: a written page number, date, title, specimen taxonomic information, the type of specimen (e.g., live, preserved, dry), and the manner in which the specimen was presented (e.g., dissecting microscope scope, compound microscope, aquarium). Each page will contain information on ONE specimen (only). There are 12 labs with 18-25 specimens per week. Plan accordingly. Three sections are required below the header on each page. Namely,
    1. **Specimen drawing**: The specimen drawing will occupy a large panel or area for the specimen drawing that extends across the entire width of the page. All drawings must include a scale bar. If the station includes a video, students will write a detailed description (= chronology or timeline) providing details for the activity observed in the video in this location and how what they saw related to or demonstrated known diagnostic characters. Additional requirements or guidelines for specimen drawings are provided in the lab manual.
    2. **Specimen observations**: Original observations will be recorded for every specimen in a smaller area below the specimen drawing where original observations of the relevant animal (e.g., color, shape, behavior) are recorded. Additional requirements or guidelines for specimen observations are provided in the lab manual.
    3. **Comments, questions, and connections**: Students will record their comments and questions that their observations generate in a designated area below the drawing. At minimum, students are required to consider the FORM and FUNCTION for each specimen and comment on basic life processes and make connections between tissue types and organs/organ systems discussed in lecture and the book. Additional requirements or guidelines for comments, questions, and connections are provided in the lab manual.

- We will follow all University laboratory safety procedures. Per University requirements: **Closed-toed shoes, socks that cover to your calves, long pants, a top that has sleeves, and a top that can be tucked in are required for all lab days.** Please do not enter the laboratory until we go in together as a group.
- Food and beverages cannot be brought into University laboratories. ***Please plan accordingly and eat before you come to lab so your brain is working at 100% efficiency.***

ATTENDANCE POLICY: *On time attendance is mandatory for this class. Late arrivals for lecture will receive half of the day's attendance points. Late arrival to laboratory is not an option.* I expect you to be seated and ready to write at the beginning of lecture (8) and lab (11:30) without your phone. **Phones should turned off or in silent mode at all times when we are together. *Please do not plan to use your phone instead of your brain and your eyes to document information in lab.*** If there is a reason that you must have your phone on during any MSCI 478 lecture or lab, please talk to me in advance.

As per the University Catalog, unexcused absences in excess of 25% of the regularly scheduled classes may result in an F for the course. Excused absences are defined in the University Catalog. Documentation will be required for any excused absence. I may excuse additional types of absences, but only if you clear it with me *ahead of time*. If you miss a class, it is your responsibility to inform me in a timely manner (within 24 hours), find out what you missed, and make up the material if it is an excused absence. There will be no make-up opportunities or adjustments to due dates for missed tests or assignments that do not have an excused absence. **There will be no make up labs.** If an assignment or test is missed because of an excused absence, students should coordinate with me over email to make up the test or turn in the assignment on a

new due date as soon as possible. The same late policies described above will be in effect after a new due date is established.

HONESTY AND BEHAVIOR POLICIES: Violations of the Student Code of Conduct (including but not limited to plagiarism, cheating, and other forms of academic dishonesty) will result in a grade of 0 for the assignment, filing of the required report to the University Academic Integrity Office, and, potentially, removal from the course with an F. Poor grades earned due to cheating or plagiarism cannot be removed through the Repeat Forgiveness Policy. For information on the Code of Student Conduct, please see your Student Handbook or https://www.coastal.edu/conduct/. For information on the Academic Integrity Code, please see https://www.coastal.edu/academicintegrity/code/

UNIVERSITY POLICIES FOR ACCESSIBILITY AND DISABILITY SERVICES: Coastal Carolina University is committed to equitable access and inclusion of individuals with disabilities in accordance with the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act. Individuals seeking reasonable accommodations should contact Accessibility and Disability Services (843-349-2503 or https://www.coastal.edu/disabilityservices/). The ADA indicates "title II and title III entities must permit service animals to accompany people with disabilities in all areas where members of the public are allowed to go." As such, service animals are permitted in lab settings at CCU. Emotional support animals are not permitted in lab settings unless it is approved as a classroom accommodation. Students with service animals are strongly encouraged, but not required, to inform lab instructors of the use of a service animal. This communication provides both the student and the instructor with an opportunity to discuss and plan for the safety of the service animal as well as any other safety concerns. Students should contact Accessibility and Disability Services regarding any potential accommodations for support and assistance.

CONTINGENCY INSTRUCTION POLICY: In the event of hazardous weather, natural disasters, widespread illness or other unexpected event that disrupts normal class and/or lab activities, listen to local radio and television stations or visit the Coastal Carolina University homepage (www.coastal.edu) for official University closing announcements. If the University closes unexpectedly, we will follow the University opening and closing schedule as well as the stated guidelines/expectations for contingency instruction.

The syllabus, course plans, and assignments may be modified to allow completion of the course. If this occurs, an addendum to the syllabus and/or course assignments will replace the original materials and will be posted to Moodle as soon as possible after the University establishes relevant operating conditions. Modifications may include remote or online delivery of course materials and modifications of the original course schedule.

TENTATIVE SCHEDULE (*Subject to Change)*

Date	Day	Lecture Topic/Activity	Text Reading	Laboratory Topic/Activity
25-Aug	TR[1]	Introduction, Classification, Body plans	Ch 1, 2	
26-Aug	F			1-Introduction
30-Aug	T	Porifera, HWK 1 due.	Ch 4	
1-Sep	TR	Porifera & Cnidaria, Hydrozoa	Ch 4, Ch 6:109-114	
2-Sep	F			2- Porifera, Cnidaria 1 -Hydrozoa, Lab notebook check
6-Sep	T	Cnidaria-Scyphozoa, Cubozoa; HWK 2 due	Ch 6: 99-102	
8-Sep	TR	Cnidaria-Anthozoa, Ctenophora	Ch 6:117-126, Ch 7	
9-Sep	F			3 - Cnidaria 2, Ctenophora
13-Sep	T	**TEST 1**		
15-Sep	TR	Platyhelminthes -Turbellaria		
16-Sep	F			**LAB PRACTICAL 1** (in class)
20-Sep	T	Platyhelminthes-Cestoda, Trematoda	Ch 8	
22-Sep	TR	Annelida-Polychaeta,Oligochaeta	Ch 13	
23-Sep	F			4-Platyhelminthes
27-Sep	T	Annelida-Oligochaeta, Hirudinea	Ch 13	
29-Sep	TR	Annelida-Siboglinidae, Nematoda	Ch 13	
30-Sep	F			5-Annelida, Nematoda, Lab notebook check
4-Oct	T	**TEST 2**		
5-Oct	W			**LAB PRACTICAL 2** (evening: 6:30 pm)
6-Oct	TR	Mollusca-Overview, Polyplacophora	Ch 12:215-222	
7-Oct	F			6-Mollusca 1: Polyplacophora, Bivalvia
11-Oct	T	Mollusca-Bivalvia, shell secretion	Ch 12:237-254	
13-Oct	TR	Mollusca-Gastropoda	Ch 12: 224-236	
14-Oct	F			7-Mollusca 2: Gastropoda, Cephalopoda,
18-Oct	T	Mollusca-Cephalopoda	Ch 12: 224-236	
20-Oct	TR	Arthropoda-diagnostic characters	Ch 14	
21-Oct	F			8-Arthropoda 1, Lab notebook check
25-Oct	T	Arthropoda-Chelicerata, Pycnogonida	Ch 14	
27-Oct	TR	Arthropoda-Mandibulata, Crustacea	Ch 14: 255-271	
28-Oct	F			9-Arthropoda 2
1-Nov	T	Arthropoda-Mandibulata	Ch 14:350-358	
3-Nov	TR	Arthropoda-Crustacea, Cirripedia	Ch 14: 373-388	
4-Nov	F			**LAB PRACTICAL 3** (In class)
8-Nov	T	***Election Day - no class***		
10-Nov	TR	**TEST 3**		
11-Nov	F			10-Echinodermata
15-Nov	T	Echinodermata - Asteroidea	Ch 20: 497-503	
17-Nov	TR	Echinodermata - Crinoidea Echinoidea	Ch 20: 505-520	
18-Nov	F			11-Invertebrate chordates
Nov 19-27: Thanksgiving Break - No classes				
29-Nov	T	Echinodermata-Holothuroidea	Ch 20	
1-Dec	TR	Urochordata, Cephalochordata	Ch 23	
2-Dec	F			**LAB PRACTICAL 4** (In class)
6-Dec	T	Echinodermata, Urochordata	Ch 20, 23	(Last class)
13-Dec	T	**TEST 4 = FINAL COMPREHENSIVE EXAM @ 8 AM, EHFA 245**		

[1] Required weekly pre-lab quizzes for each scheduled lab should be completed via Moodle between 10 AM Thursday and 10:59 AM Friday. Quizzes will not be available after 10:59 AM on Friday morning.