Invertebrate Zoology
BIOE 122 and BIOE 122L
Summer Session I 2019

General Course Information

Meeting times and location
Lecture: MW 9:00–12:30 (7 hours per week)
Lab: MW 1:30–5:30 (8 hours per week)
Location for both: Seymour Marine Discovery Center teaching classroom, 100 McAllister Way, Santa Cruz, CA, 95060. The door to the classroom is behind the blue whale skeleton.

Prerequisites
BIOL 20A, BIOE 20B, and BIOE 20C and satisfaction of the Entry Level Writing and Composition requirements. However, prerequisites are waived for summer courses.
Must be taken concurrently with BIOE 122L.

Course website
Canvas

Instructor information
Instructor of record
Gina Contolini (Gina)
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Location: OHB 255
Preferred mode of contact: email
(usually responds within a day)

Teaching assistant
Kaitlyn Stuhldreher
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Preferred mode of contact: email
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Teaching philosophy
Rather than overwhelm you with seemingly random information about animals, my hope is to guide you through taxonomic relationships and help you draw connections about animal body forms and functions and how they relate to

habitats using lectures, dissections, observations, drawings, videos, and activities.

Course Description and Materials

Course description

This course is an overview of the diversity of invertebrate life on Earth. We will cover the following major taxa: Porifera, Cnidaria, Annelida, Mollusca, Lophophorata, Arthropoda, Echinodermata, and Urochordata, in addition to other taxa. Lectures will include drawing animals, videos, discussions, activities, and quizzes. In labs we will observe and dissect invertebrate animals or go on field trips to observe invertebrate diversity.
Goals: Provide tools to understand and explore patterns in invertebrate life; build a foundation in zoology; learn basic lab skills for the study of animals.
Big picture theme: While there are only a few basic requirements for life (energy, gas exchange, circulation, reproduction, etc.), there is a huge diversity of ways to achieve them. We will explore the diversity of ways invertebrate animals meet these requirements.
Organizational flow: We start with simple animals from the more basal branches of the tree of life and work toward more complex animals at more derived branches.

Learning Outcomes

By the end of this course, students will be able to:

Lecture

1. **Name** major invertebrate phyla, classes, and orders and **describe** their relationships
2. **Describe** the basic body plans and life histories of animals in those taxa
3. **Describe** how the form of an invertebrate structure (e.g. gills) is adapted to the function it performs
4. **Compare** and **contrast** invertebrate animal structures (including their forms and functions) from different taxonomic groups

Lab

1. **Identify** the phylum, class or order, genus and species of animals we observe
2. **Identify** important structures and/or life history forms of animals we observe
3. **Observe** and **analyze** how the form of an invertebrate structure (e.g. gills) is adapted to the function it performs
4. **Observe** and **evaluate** how different invertebrate animal structures are similar or different in form and function
5. **Build** and **organize** a scientific lab notebook with diagrams and notes that makes knowledge easily accessible for future use

6. **Practice** basic lab safety with microscopes, scalpels, and live animals to gain confidence doing biological research

Materials
The course textbook is *Invertebrate Zoology* 7th ed. by Ruppert, Fox, and Barnes. It is available on reserve at the Science and Engineering Library for up to 3 days at a time. You can also purchase it at the Bay Tree Bookstore or for under $20 on Amazon or Ebay. It is also recommended to have colored pens or pencils to aid in drawing invertebrates during lectures. The lab manual is free on Canvas. For lab you must have an unlined, spiral bound, 8.5 x 11-inch notebook.

Course Assignments and Grading

Grading
Lecture grades are based on the final exam, activities, quizzes, and the lab grade. Exams will be curved as necessary. Any extra credit opportunities will be applied to the quiz grade.

- 30% final exam
- 30% midterm exam
- 20% quizzes and assignments (extra credit points applied here)
- 20% lab grade

Lab grades are based on the practical, lab notebooks, and effort/participation. Full points for effort/participation will be awarded to students who are attentive, focused, and participate in class. The lab practical will test students' ability to identify and discuss the forms and functions of the animals and concepts we cover in lectures and labs as well as apply knowledge to identify an unknown invertebrate.

- 60% lab notebook (graded twice)
- 30% lab practical exam (in week 5)
- 10% effort/participation

Lab practical

- Timed exam at the end of the course (~2 min per station)
- There will be a series of questions on each dissection where you will be asked to identify the animal, provide the name and function of a pinned structure, describe the organ system, relate form to function, etc.
- There will be an unknown invertebrate where you will identify the phylum, class or order, and the function of a labeled structure.
- Lecture material will be used in the lab practical as it relates to the animals we had in lab.

Lab notebook
The lab notebook is the major project of this class and is largely how you will demonstrate your learning in lab. In it you will draw and take notes on all dissections and observations of invertebrates. Lab notebooks are due twice: after

the fourth lab on Wed 3 Jul at 3:30 pm (labs 1–3 are included in the first grade) and again at the end of the course, Wed 24 Jul at 5:30 pm (labs 4–8 are included in the second grade). Final notebook scores are based on cumulative points for all eight labs, i.e. we will not average your two notebook scores. Notebooks are graded based on completeness and accuracy, not artistic ability. Complete details on notebook grading can be found at the end of this document.

Grading scale for both lecture and lab

A	≥ 90.0 %
B	80.0–89.9%
C	70.0–79.9%
D	60.0–69.9%
F	≤ 59.9%

Course Policies

Students are expected to be on time for all lectures and labs and be respectful of each other, equipment, and live animals. Quizzes and exams cannot be made up except in extreme circumstances with sufficient documentation (i.e. doctor's note). You can make up or finish labs from after the first notebook check (labs 4–8) the last lab day (Mon 22 Jul) before the final.

Academic integrity

Any copied labs, assignments, or exams will receive zero credit. Late assignments (e.g. lab notebooks) lose 5% of their grade for each day they are late.

Academic integrity is the cornerstone of a university education. Academic dishonesty diminishes the university as an institution and all members of the university community. It tarnishes the value of a UCSC degree.

All members of the UCSC community have an explicit responsibility to foster an environment of trust, honesty, fairness, respect, and responsibility. All members of the university community are expected to present as their original work only that which is truly their own. All members of the community are expected to report observed instances of cheating, plagiarism, and other forms of academic dishonesty in order to ensure that the integrity of scholarship is valued and preserved at UCSC.

In the event a student is found in violation of the UCSC Academic Integrity policy, he or she may face both academic sanctions imposed by the instructor of record and disciplinary sanctions imposed either by the provost of his or her college or the Academic Tribunal convened to hear the case. Violations of the Academic Integrity policy can result in dismissal from the university and a permanent notation on a student's transcript.

For the full policy and disciplinary procedures on academic dishonesty, students and instructors should refer to the Academic Integrity page at the Division of Undergraduate Education.

DRC Accommodations
The Disability Resources Center (DRC) reduces barriers to inclusion and full participation for students with disabilities by providing support to individually determine reasonable academic accommodations. If you have questions or concerns about exam accommodations or any other disability-related matter, please contact the DRC office, located in Hahn 125 or at 831-459-2089 or drc@ucsc.edu.

Title IX
The university cherishes the free and open exchange of ideas and enlargement of knowledge. To maintain this freedom and openness requires objectivity, mutual trust, and confidence; it requires the absence of coercion, intimidation, or exploitation. The principal responsibility for maintaining these conditions must rest upon those members of the university community who exercise most authority and leadership: faculty, managers, and supervisors.

The university has therefore instituted a number of measures designed to protect its community from sex discrimination, sexual harassment, sexual violence, and other related prohibited conduct. Information about the Title IX Office, the online reporting link, applicable campus resources, reporting responsibilities, the UC Policy on Sexual Violence and Sexual Harassment and the UC Santa Cruz Procedures for Reporting and Responding to Reports of Sexual Violence and Sexual Harassment can be found at titleix.ucsc.edu.

The Title IX/Sexual Harassment Office is located at 105 Kerr Hall. In addition to the online reporting option, you can contact the Title IX Office by calling 831-459-2462.

Course Resources

Course website: www.canvas.org
Invertebrate websites: www.asnailsodyssey.org, www.shapeoflife.org
Study guides will be available on canvas as needed

Important 2019 Deadlines
Session 1:
Drop: Monday, July 1
Request for “W”: Friday, July 12

Neither Summer Session nor instructors drop students for non-attendance or non-payment. Students must drop themselves. Dropping results in full tuition reversal/refund. Withdraw posts a W for the grade and full tuition is charged (no refund).

For all dates and deadlines, including ‘change of grade option’ (P/NP) and grades due, here is the summer academic calendar: https://summer.ucsc.edu/studentlife/index.html

For questions about dropping, requesting a W grade for a course, or withdrawing from the summer quarter, email summer@ucsc.edu.

Name: _____ Locker #: _____ Combination: _____

Lab Rules and Notebook Requirements

Lab rules. We share this space with the Seymour Center and we must be respectful.

- Enter through the wet lab or door outside the admin office. It is behind the blue whale skeleton. Do not enter through the main entrance or admin hallway
- Food is only allowed by the front table
- No open-toed shoes.
- Bathrooms out the door to the right, then take another right
- No bikes in lab
- Do not poke, feed, touch, or mess around with critters in water table
- Do not hang out in Seymour Center lounge area or use their kitchen
- Do not tamper with the microscopes. Let us know if you have a problem
- Be gentle with microscopes and carry them with two hands
- Clean up when you are done. This includes:
    - wash your dishes and put them in the drying rack
    - wipe off your microscope with fresh water (but DO NOT wipe the lens except with lens paper)
    - wipe table with a sponge and fresh water
    - rinse your dissection tools if you don't want them to rust immediately

Things you need to bring to each lab

- Dissecting kit
- Lab notebook and pencils
- Appropriate dissection guide. **You must read the dissection guide before coming to lab**. You can download the dissection guide from the class website
- Lecture text (*Invertebrate Zoology*) and lecture notes
- An old towel
- Shoes with closed toes

Notebook requirements

Notebooks must:

- be bound; a spiral bound notebook is recommended.
- be at least as large as 8 x 10 inches
- have completely blank, unlined pages
- have at least 80 pages
    - You cannot turn in any loose papers. If for some reason you have done drawings on loose paper they must be neatly taped into your notebook
- have a table of contents, so leave the first three pages blank
- have page numbers—you may write them in
- have your name and section clearly written on it

You can buy sketchbooks at the BayTree Bookstore, Palace Art and Office Supply, Lenz Arts, or CVS, for about $10.

Each drawing must:

- Be neat and clear
- Be in pencil, not ink. Color is optional, but usually very time consuming
- Be big—at least 4 by 4 inches (10 by 10 cm)
- Be alone on its page unless specific directions are given otherwise
- Convey as much information as possible about the animal

- Include taxonomy labels
    - Labels go in the top right-hand corner of every page that has a drawing: Phylum, Class, Genus, Species. Yes, you will repeat these a lot since you'll always have many pages of drawings for the same species
- Be titled with the type of dissection and the view
    - Titles go in the top left-hand corner of every page that has a drawing
    - Underline the title
        - (examples: External Anatomy, dorsal view; Circulatory System, ventral view)
- Include scale bars
    - These are extremely important so you know how large or small the object you drew actually was
    - Please use metric units
- Indicate orientation with orientation markers around your drawings (examples: A, P, D, V, LL, RL which stand for anterior, posterior, dorsal, ventral, left/right lateral)
- Include some annotations: Annotations are explanatory notes about your drawings and can include but are not limited to the following:
    - Observations of the live animal—What was it doing? How does it move/feed? How do the cilia move? How does it respond to light, touch, etc.?
    - What you did—How did you open the animal? What parts did you remove in order to see the view that you drew? Note any mistakes that you made in cutting the animal that might explain why it looks different than the expected dissection, etc.
    - Keys to any colors that you used in your drawing
    - Descriptions of what you see—Note color(s) and texture(s) of organs you drew. How is the body put together? Which way does the blood flow? Did you see the heart pumping?
    - Functions of organs—Here you can supplement using material from lecture to give yourself a better study guide. Some of the questions on the lab practical will ask the function of certain organs you drew.
    - Answers to questions in the manual or that come to mind during the lab.

Conclusion:
Each lab (not each drawing) must have a conclusion. This can be a brief paragraph with flexibility with regard to the topic, although we will often give you questions or ideas to answer/ponder in this discussion. This is a good opportunity to relate the lab to lecture topics, describe how the lab specimen has evolved from the ancestral version (hypothetical or real), and how/why it has evolved to inhabit its current ecological niche.

Points will be lost if any of the guidelines listed above are not met.

****Remember, your lab notebook will be your primary study guide for the lab practical so the better you make it, the more it will help you in the end!!!!****