Comparative Vertebrate Anatomy: BIOE 134/L  
Summer 2019  
Lecture (70889): Tuesday, Thursday 9:00AM-12:00PM Coastal Biology 115  
Lab (70890): Tuesday, Thursday 1:00-4:00PM Coastal Biology 115

Instructors: Dr. Rita S. Mehta  
Office Hours: *12-1pm T & Th, or during labs, or by appointment  
Phone: 831-459-1490 (office)  
Emails: rmehta2@ucsc.edu

TA: Ana Valenzuela Toro (anmavale@ucsc.edu)  
Office Hours: *Ana will be available during the labs, after labs for about an hour, or by appointment. Ana’s office is in the Costa Lab, CBB 169.

*To schedule appointments outside office hours or outside of lab, please email us with your availability.

Book: Your Inner Fish, by Neil Shubin (Available on Canvas)  
Lecture Material: Much of lecture material comes from select chapters from Comparative Anatomy, Function, Evolution. K. Kardong 7th Edition and original research from the PI’s lab or the primary literature for papers. All readings will be provided. You are more than welcome to come and look at my lecture notes after class/ during lab. I do not allow students to take photos of power points or anything else during lecture. Photos of dissections are allowed and you are required to sign a waiver which outlines your understanding of how photos are to be used - only for studying purposes and never for social media.

Course Objectives and Goals:  
1. Understand basic concepts of evolutionary biology and classification of vertebrates.  
2. Become familiar with form and diversity of the following systems: Skull, axial skeletal, and muscular system  
3. Be proficient in anatomical dissection  
4. Understand basic principles of functional morphology; in particular, how form contributes to different feeding and locomotor behaviors.

Grading:  
Lecture:  
3 Exams: 2 Midterms & 1 Final (100 pts each)  
6 Quizzes (10 pts each) inner fish  
Participation (in class/OH)  
Assignments (in/outside lecture)  
Fish Skull Activity (10 pts in class/lab, 10 pts take-home activity)  
Designer Skull  
Design your own skull with motion  
Sketch Science paper  
Meet with me to discuss sketching  
Communication  
Total possible points 430

Letter Grades (based on %):  
97-100 = A+  
90-93 = A  
87-89 = B+  
84-86 = B  
80-83 = B-  
77-79 = C+  
74-76 = C  
70-73 = C-  
60-69 = D  
< 60 = F (no course credit)
Laboratory:
- 2 Lab practicals (100 pts each) 200
- 1 Mock practical 10
- Selection of fish skull 10
- Dissection (6 x 10 pts) 60

Total possible points 280

Attendance/Participation: Required for all lectures and laboratories. Students must be punctual to class. Attendance and participation are components in your evaluation. Only rarely are course exams allowed to be made up, and then only with a written medical excuse from your physician. We cannot make up labs in summer session. You are welcome to perform the lab on your own. You will be docked 5 points for each lab and each dissection that is missed.

It is imperative that you come prepared to lecture and laboratory. The laboratory reading assignments should be read BEFORE coming to lab. We will be lenient on the first lab if needed. All of these materials will be on Canvas. If you have to miss lab for any reason that is not a medical emergency, we expect that you will make time to conduct your own dissection at home.

Examinations: Students will not be allowed to leave the room during any examination. Please use the restroom ahead of time. No make-up exams will be given with the exception of a legitimate medical excuse (must be doctor’s written medical excuse).

Honor Code: There will be zero tolerance on infractions to the honor code. Please refer to http://deanofstudents.ucsc.edu/pdf/student-handbook.pdf (Pay special attention to the following sections: 102.011 Cheating, 102.012 Plagiarism, 102.013 Furnishing false information in the context of an academic assignment, 102.014 Creating an improper academic disadvantage to another student or an improper academic advantage to oneself, 102.015 Interference with courses of instruction, and 102.016 Theft or damage of intellectual property).

At the end of the course, students with continually improving grades may be given some additional consideration. An incomplete grade (I) is given only in accordance with university criteria (see http://registrar.ucsc.edu/navigator/section4/performance/incomplete%20.html; if criteria are met, a written contract must be signed both by instructor and student, it is not intended as an escape clause for poor performance).

How to learn anatomy: Comparative Vertebrate Anatomy is not a course that can be easily learned in a few hours a week. The dissections take time and there is nothing that takes the place of spending the necessary time in the lab as allotted every Tuesday and Thursday.

To successfully learn the principles examined in this course, we encourage you to come to lectures, review your notes, and practice new terminology. In addition, study groups with your fellow students will allow you to further explore the material by teaching each other. Learning biology does not involve osmosis-rather, you must actively review the material from the textbook, lecture, and laboratory. We are also available if you have any questions, concerns, or comments. If you are still unsure on how to study, feel free to contact us. Please refer to the syllabus for our availability.

What is conceptual about anatomy? Understanding muscle attachment, origin and insertions, how contraction works is all conceptual. Spatial orientation should be somewhat intuitive and will help you understand how movement occurs through contraction of different muscles. Terminology is absolutely
not conceptual. Terminology is memorization. Terminology is how we will communicate so please learn your terminology.

**Use of Animals**
In this class we will be dissecting a number of different animals including a lamprey, fish, frog, and rat. We expect that all animals will be dissected properly and respect be given to the animals. We use real animals for dissection because it provides greater learning than models or computer programs. To learn anatomy effectively, you must get your hands dirty (figuratively, we have gloves to keep your hands clean). If you have concerns with the dissections, please come to see me so we can discuss your concerns. Dissection is required and learning this subject matter will be much easier if you work in teams of 2 while making yourself accountable for learning all of the material.

**Accessibility:**
Students with disabilities are encouraged to speak to Professor, Rita, and TA, Ana, about accommodations they may need to produce an accessible learning environment.

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**Syllabus for Comparative Vertebrate Anatomy Lecture and Lab**
(The syllabus is a guide and may change according to unexpected events. Please be flexible)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture (9:00 AM – 12:00 PM)</th>
<th>Lab (1PM – 4PM)</th>
<th>Readings (home work)</th>
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| 1    | Tuesday 7/30 | *Lecture:* Chordate Origins  
*Reading:* Agnathan Background for Lab | 1. Lab Etiquette  
2. Lamprey Dissection & Quiz  
3. Clean up and get checked off | Chapters 1-2 of Your Inner Fish for quiz on 8/01 |
|      | Thurs 8/01 | Quiz 1: *Inner fish* Chapters 1-2 + Discussion  
*Lecture:* Survey of Vertebrates Diversity  
**Build a Fish Skull**  
**MIDTERM 1 is next week!** | 1. Assign selection to fish skull  
2. Fish Morphology & Musculature  
3. Go over clean-up  
4. Clean up and get checked off | Chapters 3 & 4 of Your Inner Fish |
| 2    | Tues 8/06 | *Midterm 1: Material from week 1 + Inner Fish 1-4*  
*Quiz 2: Inner fish 3 & 4 + Discussion*  
*Lecture:* Skull Diversity and Feeding  
**Vote on flipping lab and lecture** | 1. Frog Dissection  
2. Review Lamprey, Fish, Frog  
3. Mock practical  
4. Clean up and get checked off | Chapters 5,6 of Your Inner Fish |
|      | Thurs 8/08 | *Quiz 3: Inner fish 5 & 6 + Discussion*  
*Lecture:* Finish Skull Diversity & Feeding | **First Lab Practical**  
**Lamprey Fish,** | Chapters 7-8 of Your Inner Fish |
<table>
<thead>
<tr>
<th>Date</th>
<th>Assignment/Activity</th>
<th>Lecture/Quiz/Discussion</th>
<th>Reading/Notes</th>
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<tbody>
<tr>
<td>Tues 8/13</td>
<td><strong>Take-Home Assignment:</strong> Design a skull (1 week)</td>
<td>Frog dissection</td>
<td>Help Clean up and get checked off</td>
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<td>Go over parts of the mammal skull / Go over teeth</td>
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<td>Thurs 8/15</td>
<td><strong>Quiz 4:</strong> Inner fish 7-8 &amp; Discussion</td>
<td>Skull Diversity Lab Part I</td>
<td>Chapters 9-10 Your Inner Fish</td>
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<td>Go Over Midterm Exams</td>
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<td>Start reading Standen 2011</td>
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<td>Skull Diversity Lab Part II</td>
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<td>Tues 8/20</td>
<td><strong>Midterm II</strong> (Lectures- Skull Diversity + Axial Diversity+ Your Inner Fish Chs 5-10 ) →</td>
<td>1. Rat Dissection &amp; Quiz</td>
<td>Chapter 11 &amp; Epilogue</td>
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<td></td>
<td><strong>Assignment of Design a Vertebrate Skull is due! 20 points – present to class</strong></td>
<td>2. Clean up and get checked off</td>
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<td><strong>Lecture:</strong> Axial Skeleton/ Appendicular skeleton</td>
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<td>Thurs 8/22</td>
<td><strong>Quiz 5:</strong> Inner fish 9-10 &amp; Discussion</td>
<td>Axial Diversity Lab Continued from Lecture</td>
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<td>Assignment of Design a Vertebrate Skull is due! 20 points – present to class</td>
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<td>Start reading Ch 11</td>
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<td><strong>Lecture:</strong> Axial Skeleton/ Appendicular skeleton</td>
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<td>Finish reading Standen 2011</td>
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<td>Tues 8/27</td>
<td><strong>Final Exam</strong></td>
<td>1. Review of Rat</td>
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<td><strong>Sketch out the article</strong>- science communication- 1 sentence important point summary and sketch (it is not about the sketch, it is about the communication): how many drawings, digital means, how long….; peers listen and learn about the discovery</td>
<td>2. Clean up and get checked off</td>
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<td>Vote on starting final exam at 10 am</td>
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<td>Thurs 8/29</td>
<td><strong>Talk to Rita and Ana final grades; Office hours (Beginning at 10:00 am until 11:30 am)</strong></td>
<td>1. Review of Rat</td>
<td>Final Practical</td>
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<td><strong>Final Practical</strong></td>
<td>2. Clean up and get checked off</td>
<td>Go over answers; Ana and I clean up</td>
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<td><strong>Congratulations- You have completed a challenging course this summer!!!</strong></td>
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