

# ZOO 3713C – Comparative Vertebrate Anatomy

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"We are part of nature, a product of a long evolutionary journey. To some degree, we carry the ancient oceans in our blood. ... Our brains and nervous systems did not suddenly spring into existence without long antecedents in natural history. That which we most prize as integral to our humanity - our extraordinary capacity to think on complex conceptual levels - can be traced back to the nerve network of primitive invertebrates, the ganglia of a mollusk, the spinal cord of a fish, the brain of an amphibian, and the cerebral cortex of a primate."

*Murray Bookchin, social and ecological activist*

## **Why should we care about vertebrates?**

The quote above illustrates the most obvious reason – vertebrates are us! We can learn much about our role in the world, our place in the history of the earth, and about our own bodies and physiology by studying vertebrates. Although they are not the most species rich group of animals, they could be argued to be the most ecologically diverse, spanning a breathtaking range of habitat types, geographical distribution, and body size. The current biodiversity crisis has had a disproportionate effect on vertebrates and many are used as indicators of the health of ecosystems. In this class we will use the tools of evolutionary trees, structure and function relationships, and biomechanics to answer fascinating questions such as: Why are some vertebrates so much bigger than the largest non-vertebrates? How is a human like a shark? How did the bodies of vertebrates change when they colonized land? Am I more closely related to an elephant or a mouse? How are the bodies of bats different from those birds in the ways they are able to achieve powered flight? How did vertebrates become so complex?

## **What will I be able to do after successfully completing this course?**

- 1) Draw, read and correctly interpret an evolutionary tree diagram and understand the story it tells about the evolutionary history of the vertebrates and the relationships between vertebrate groups.
- 2) Use structure/function relationships to make inferences about the lifestyle of early vertebrates and their ancestors to understand patterns of diversity and complexity in early vertebrate evolution.

- 3) Identify features of the vertebrate body plan that are common to all vertebrates.
- 4) Compare and contrast homologous structures in different vertebrate groups and explain how evolutionary history and adaptation for a function contributed to their current form.
- 5) List the evolutionary novelties that distinguish each major vertebrate clade from other clades and map these onto a cladogram of the vertebrates.
- 6) Use simple physics to compare the functional consequences of different configurations of anatomical structures.
- 7) Demonstrate competent dissection skills and ability to identify major anatomical structures in the context of the whole animal.

### **How will I learn to do all this?**

Education, the process of creating knowledge, values, and information, is going through a transformation from a teaching oriented process towards an active learning process in which students engage in an active, challenging role in each class session. Results from empirical studies indicate that knowledge is better created, retained, and used by students when acquired through active, participatory learning rather than a passive, receptive process (Fink, 2003). Following these findings, this course is centered in an active learning rather than a passive teaching model. The structure of the course is designed to motivate and engage students in learning activities that promote critical thinking through the solution of concrete problems.

As a result of the active learning model, this course emphasizes DEEP LEARNING rather than superficial memorization of facts that will be promptly forgotten. Although facts can be memorized, **understanding is not downloadable**. The key to deep learning is engagement. In this class you will be an active learner and you will only master the material if you take all available opportunities to participate and engage with it. *You will learn from this course in proportion to the amount of effort you put into it.*

To allow time for learning activities in class, much of the information delivery will occur outside class through readings, videos, and web lectures. The learning plan for this course consists of five basic components: Preparation, Participation, Practice, Performance, and Polishing. Performance is the most straightforward and familiar. It will consist of three multiple choice exams and a multiple choice cumulative final exam. To help you to perform well on these exams, I will offer opportunities to do activities for Preparation, Participation, and Practice

each week. After each exam there will be opportunities to earn points for Polishing your learning strategy by reflecting on your exam preparation and performance. These opportunities will be given in the form of what I like to call **à la carte learning** activities. No single assignment is required **with the exception of the lab activities** (please see laboratory information below). Each is worth a certain number of points toward your final grade and you can choose which activities you wish to do. A number of learning activities will be available each week for Preparation, Participation, and Practice and there will be due dates for each assignment each week. Points for Performance and Polishing will be available during and just after each exam, respectively.

All work will be evaluated using a method called specifications grading. A list of specifications for each assignment is available on the course website in the “Grading Specifications” link. If the assignment meets all of the specifications, it will receive the full number of points. If it does not meet one or more of the specifications it will receive zero points.

### ***With freedom comes responsibility***

Because each of these assignments is an opportunity to gain points and none is required, you will need to plan your time carefully. During the first week of class I will give a couple of examples of weekly work plans and at the beginning of each week I will announce how many points you should have at that point to meet your goal of earning an A in the class. Assignments will not be accepted after their deadlines, but if you miss a deadline don't worry. There are always lots of opportunities to earn more points. Exam points are added to your total points in exactly the same way as assignment points, so exams are technically not required. Therefore, I will not give makeup exams under any circumstances. I strongly advise you to make every possible effort to take all of the exams because they are worth a large number of points that you can get with relatively little effort (especially if you have been doing all of the other P's each week!). If you do have to miss an exam for any reason you can make up those points by doing extra assignments.

### **How will the labs go?**

Each week in lab you will be guided through a series of observations, sketches, questions and/or problems that you will complete in your lab notebooks and will earn up to 20 points per lab toward your grade (see grading section below for details). Please bring your lab manual (or photocopies of relevant sections) and lab handouts to each lab session. The labs are designed to be collaborative activities, but the lab notebook you turn in must be your own work. Any lab notebook submissions that

resemble one another too closely will each be given a score of 0. These will be turned in to the lab instructor at the beginning of lab the week following that lab exercise. If your lab notebook is not received before the start of lab it will be considered late. You will *not* be evaluated on the quality of your artwork, but your diagrams and drawings must be clear and well labeled for full credit. **All lab assignments must be turned in and receive a grade above 0 to receive a passing grade in the class.**

**Attendance and participation in all lab sessions is mandatory.** Each lab will be worth 20 points toward your grade. You will get full credit for work that is thoughtful and complete, 10 points for poor effort or incomplete work, and zero credit for minimal effort. The lab instructor may award an additional 5 points for exceptional work on lab reports. **You must have a score of at least 10 on every lab throughout the semester to pass the course.** The only exception is the first lab, which will still count toward your grade, but you may get a 0 on it and still pass the class. If you get a grade of 0 on any lab assignments you may resubmit the assignment within one week to attempt to improve your grade to a maximum of 10. You may only do this if you initially turned in the lab assignment on time. You will have only once chance to resubmit your assignment. If you do not understand why you received a 0 on your lab assignment, it is your responsibility to see the lab instructor to discuss it.

The class sessions are designed to provide broad context and large conceptual ideas, but the actual anatomy will be learned in the lab. You will be working in pairs to complete the lab exercises, so please keep in mind that your lab partner is counting on you. If you absolutely must miss a lab, please make arrangements in advance if possible to make up the lab, or if the absence is unforeseeable, please make arrangements to make up the lab as soon as possible after the absence. We will hold open lab sessions to finish lab assignments, make up missed labs or for additional study time. No students will be allowed in the lab without an instructor present. Please use this time to make up missed labs if you possibly can, but if it is impossible for you to attend the scheduled open labs, please contact the lab instructor to see if other arrangements can be made. We will accommodate you if we can, but cannot guarantee that missed labs can be made up.

### **How will my final grade be determined?**

Your final grade will be determined by the total number of points you earn in all categories of learning activities.

Points	Grade
1711 - 1800	A
1621 - 1710	A-
1561 - 1620	B+
1501 - 1560	B
1441 - 1500	B-
1381 - 1440	C+
1261 - 1380	C
1081 - 1260	D
below 1080	F

## **Respecting your learning process and that of others Aka “Academic Integrity”**

Professionals in any field are expected to maintain the highest standards of ethics, integrity, and personal responsibility at all times. The best way to make these standards a matter of habit is to use them consistently at all times. This course is designed to be highly interactive and collaborative; a culture of trust is essential for it to work well. When you cheat you deprive yourself of an opportunity to learn; when you help someone else cheat you are robbing them of that learning opportunity. We are all honest people here – be your best self.

Studies have shown that the majority of cases of plagiarism are unintentional mistakes. You will submit all of your prep assignments through TurnItIn to self-check for plagiarism or copying from other students. I will always set assignments for unlimited submissions and allow you to view your originality report so that you can self-correct any inadvertent matches. I do not have a set matching percentage that I use to determine copied work, but I look at each originality report and make a judgment call. Avoid any matches that exceed four words in length (except for names of things that have multiple words) and consecutive matches from the same source. If I determine that an assignment has an unacceptable similarity to other sources, it will not be accepted. In the case of matches to another paper from the class, both papers will receive a zero. If there is any chance that another student has had access to your paper, it is in your interest to check your originality report repeatedly until the due date. If you are the first to turn it in, you will see low similarity, but once the other student has submitted their paper, it will go up.

Although you are an honest student, there may be times when you are tempted to help another student cheat. Any student seen with more than one iClicker in class will have all clickers confiscated, to be

returned after their numbers are recorded, and all clicker numbers involved will lose all clicker points for the entire semester.

I will follow strictly the “Student Handbook” regarding cheating. Procedures for both formal and informal procedures can be found under the section “Academic Misconduct” in the “Conduct & Policies” chapter.

*“Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and to honestly demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.”*

## **What resources will I have available?**

### **Your Learning Community**

Your most important resource in this class will be all of the people around you. This class heavily emphasizes group work and peer-to-peer teaching. In addition to your classmates, you have an enthusiastic team of learning assistants (LA’s) who are eager to help you both in class and out. The learning assistants are undergraduate students who have been successful in this course in a previous semester and have returned out of a strong desire to help you succeed as well. Last, but certainly not least, I am absolutely committed to seeing every student do very well in this class. I am available before and after class, during office hours (or by appointment), and by email and am very happy to help you out with anything.

### **Textbooks and Supplies**

Everything listed below is available from the FIU Bookstore.

Required textbook:

*Vertebrates: Comparative Anatomy, Function, Evolution*, 7<sup>th</sup> edition.

Kardong

*Comparative Vertebrate Anatomy: A Laboratory Dissection Guide*, 7<sup>th</sup> edition. Kardong and Zalisko

Lab Materials:

Required: dissection kit, 3-ring binder, plain and lined paper, colored pencils. Eye protection is required. If you do not wear glasses, please purchase lab goggles. Sunglasses are not acceptable eye protection.

Suggested: A lab coat is recommended for dissection labs.

Gloves and all other lab supplies will be provided. It may also be useful to bring colored pencils or pens with you to lecture and lab as some of the material will be color-coded.

iClickers will be required for each class session; all iClicker versions are acceptable. The course will be set up to enable iClicker REEF, but please be advised that I cannot be responsible for any problems with connectivity, so use of iClicker REEF must be strictly at your own risk. For rare occasions when you forget to bring your iClicker to class, a free trial version of the REEF app can be used, but please be advised that the trial period will end after a certain period of time after which you will be responsible to make sure that your clicker is present and in working order.

### **Course Website**

Our course website will be in the Blackboard Learn platform. Please log on as soon as possible to make sure you have access. All course materials including extra readings, lecture handouts, videos, etc. will be distributed electronically and it is your responsibility to retrieve these materials. In addition, all written work will be submitted through the course web page, so you don't want to wait and find out that you can't get in when you have something due. When you login to Blackboard Learn from the [ecampus.fiu.edu](http://ecampus.fiu.edu) site using your my account credentials, you will see your Blackboard Learn Courses listed at the top of the page. Click on a course to go into the course.

NOTE: You will not see a Blackboard Learn course in the My Courses block until your instructor makes it available to the students. If you don't see your class in My Courses when you login,

- Check with your instructor to find out if he or she has made the course available to students. Most instructors will do this the first week of class, but this is up to your instructor.
- If you recently registered for the course in the PantherSoft class schedule, it may take a few hours or overnight until you see the course in the My Courses block.

If you still don't see a Blackboard Learn course you believe you should have, call the UTS Support Center at 7-2284 for assistance.

### **iClickers**

There will be several clicker questions given in each class session. I will update iClicker scores on a weekly basis and your score will always reflect your total number of points so far in the semester. **It will be your responsibility to make sure that your clicker points are being recorded correctly.** If your score is not accurate, you must contact me within one week to correct the problem. After that time, I cannot guarantee that the problem can be solved. Participation in the clicker questions add up to a large number of points, so please make sure you bring your clicker to each class. Because of the possibility of writing down the correct answer after it has been revealed, I cannot accept written answers to clicker questions, so it must be your responsibility that your clicker is not lost, forgotten, or nonfunctional.

### **Class Facebook page**

This is an optional forum where you can post questions, resources, interesting articles, cartoons, or anything relating to biology. We will share all of the extra videos, web tutorials, and other helpful resources on the web that we find here, so it can be a really great resource. In addition, we periodically will hold virtual office hours in the Facebook group, so it is a great way to get questions answered quickly without having to go to physical office hours. To join, search under [CVA - Bishop](#) (or use this link) and request to join. This is a closed FIU group, which means that you have to join FIU groups (search “FIU groups and follow the prompts) and join using an FIU email address before you can see it.

## **Schedule of topics**

*Jan. 9-Jan. 25*

### **Unit 1 – Origin and Diversity of Vertebrates**

- What's so great about vertebrates?
- Evolutionary tree thinking
- Where did vertebrates come from?
- Major transitions in vertebrate history
- Vertebrate development

Exam 1: Monday, Jan. 30

*Feb. 1-Feb. 20*

### **Unit 2 – Skin and Bones**

- Integument and integumentary structures
- Origin of skeletons
- Properties of bone
- Cranial, axial, appendicular skeleton
- Fins to limbs

Exam 2: Wednesday, Feb. 22

*Feb. 27-Mar. 22*

### **Unit 3 – Force and Movement**

- Limbs as levers
- Can muscles be strong and fast?
- Muscle form, function, and evolution
- How to hold your body up off the ground
- Built for speed

Exam 3: Monday, Mar. 27

*Mar. 29-Apr. 17*

### **Unit 4 – Material Transport**

- Fick's Law of Diffusion and Size Matters
- Respiration, Circulation, and Digestion
- Getting rid of waste

Exam 4: Wednesday, Apr. 19

Final Exam: TBA

# À la Carte Learning Menu

Please see “Grading Specifications” and individual weekly assignments for details.

## **PREPARATION**

Written Preparation Assignments – 12 points

Cladogram – 6 points

Concept Map – 6 points

Terminology Study – 6 points

Transcribe Lecture Notes – 4 points

## **PARTICIPATION**

Clickers – 1 point per correct response (average 5 per class)

In-class activities – 2 points per activity (average 6 per class)

Presentation – 10 points, only once per semester

## **PRACTICE**

Revise prep – 10 points

Peer Response – 10 points

Question of the Week – 5 points

Assignments – variable points

Quiz – 5 points

Write an Exam Question – 5 points

## **LABORATORY**

Lab notebook assignments – 20 points

## **COMMUNITY**

Post to Facebook group – 1 point

Post to Blackboard discussion board – 1 point

Film Review – 1 point

Study group – 1 point

Office hours – 1 point

## **EXAMS**

Midterm: Individual – 100 points

Midterm: Group – 50 points

Lab Exam – 100 points

Final: Individual – 200 points

Final: Group – 100 points

## **POST-EXAM REFLECTION**

Exam wrapper – 10 points

Correct Your Answers – 10 points

***Want to get credit for a great learning activity you already do?*** Write a description of the learning activity along with an estimate of how much time it takes and send it to me and I will consider adding it to the menu of learning activities.