Advanced Paleobiology

Geology 497Q/597Q
Winter 2019

Course Information

Instructor: Dr. Robyn Mieko Dahl
Email: robyn.dahl@wwu.edu
Office: ES 340
Office Hours: Tue 2:00 – 4:00 PM in ES 340
Mon & Wed 9:00 – 10:00 AM in SL 210
Or by appointment

Course Overview

In this course, we will be learning important research skills and methods related to the field of paleobiology. We will be taking a "quantitative paleobiology" approach, meaning that we will use analytics, data science, and modeling to ask and answer questions about evolution and the history of life on Earth. To do this, you will learn some basic computer programming in the programming language R, and you will learn how to share code on GitHub, a site used widely by scientists and programmers. We will also learn how to access and analyze data from the Paleobiology Database.

Learning Outcomes

- Students will be able to use R programming to conduct appropriate quantitative analyses including (but not limited to): geometric morphometric methods (GMM), principle components analysis (PCA), and phylogenetic analysis.
- Students will create and maintain a GitHub repository.
- Students will be able to access, analyze, and interpret data from the Paleobiological Database (PBDB).
- Students will be able to perform current methods of quantitative ecological analysis, including (but not limited to): the appropriate calculation of abundance, geographic range size, biodiversity, ecological similarity, sample standardized biodiversity, and evenness.
- Students will be able to explain current and historical models of biological extinction, including (but not limited to): the International Union for the Conservation of Nature extinction risk criteria, the "field of bullets" and "gambler's ruin."

Grading

Lab Assignments: Lab assignments are the core of this course. While there will be some explanatory lectures during class meetings, most of our time will be spent collecting and analyzing paleobiological data. Each lab assignment is designed to either develop your understanding of a particular method or to explore an important concept in paleobiology. We will begin each lab assignment in class, but you should budget time outside of class to complete your lab assignments. All lab assignments will include a lab report that you will write as a Markdown file and post to your Github repository.

Lab Assignments are worth 50% of your final grade

Quizzes: Quizzes will cover key methods and concepts that are explored in lab activities. Some quizzes will be given as take home assignments and others will be given in class.

Quizzes are worth 20% of your final grade

Class Participation: Your class participation grade is calculated based on your attendance and your engagement during class meetings. Science is collaborative and you will be working with your classmates to collect, analyze and interpret data. If you miss class, your absence will affect your classmates' learning experience as well as your own. Class participation is graded out of 100 total points. Throughout the quarter, you will be able to track your participation score on Canvas.

Class Participation is worth 20% of your final grade

Final Exam: The final exam will be taken in class on **Monday, March 18th from 1:00 – 3:00 pm.** This exam will include a programming component as well short answer questions covering paleobiology content explored throughout the quarter.

The Final Exam is worth 10% of your final grade

Final Grade: Your final letter grade will be assigned using the following scale. No curve will be used in determining individual assignment or final letter grades.

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
>94%	90-93.9	87-89.9	84-86.9	80-83.9	77-79.9	74-76.9	70-73.9	67-69.9	64-66.9	60-63.9	<60%

Extra Credit: No extra credit assignments will be given.

Other Course Policies

Computers: You will need access to a computer with internet access, R Studio and FIJI for this course. A personal laptop is recommended, but you can also use the department computers in ES 214 (where we will be meeting for some of our class periods). R Studio and FIJI are free to download and links are provided on the class GitHub repository and Canvas site. Please speak to your instructor if you have any questions about computer access or the required software.

Attendance: Students are required to attend all class meetings. If you miss a class for an acceptable reason (such as a medical or family emergency, an academic conference, etc.), you must let the instructor know ***before*** class via email and you are required to make up any missed classwork by the next class meeting. Each missed class, regardless of reason, will drop your participation grade by 5 points.

Late Assignments: All late assignments will automatically receive half credit. This means that your assignment will be graded normally, and then your score will be reduced by 50%, so if you received a 8/10 (80%), your score will be reduced to a 4/10 (40%).

Academic Honesty: Upholding academic honesty is integral to the educational mission of WWU, particularly in assessment and recognition of student performance. Recognizing the intention of WWU to promote and sustain a culture of integrity, the university's academic honesty policy serves a key role as part of a comprehensive program to encourage behaviors of integrity and discourage violations of such behavior. All students and faculty of WWU are responsible for being familiar with this policy (POL-U2100.02) and the processes for reporting and appealing violations that it includes.

An Academic Honesty Violation occurs when students:

- Claim as their own achievements, work, or arguments of others
- Use unauthorized resources to complete a course assignment or requirement
- Help someone else to engage in academically dishonest behavior

There will be many times in this course when you may choose to or are asked to work collaboratively with your classmates. In these situations, it will be important to clarify your own contributions to the finished product, and to complete work in your own words. If a question about the logistics of collaboration arises, it is best practice to ask your instructor how to proceed to ensure that you are working in accordance with the university's academic honesty policy.

Assignments

The following schedule is subject to change throughout the quarter, depending on the pace that we move through the material. Check Canvas and the course GitHub repository for an up to date schedule, including dates for quizzes (which are not included on this schedule).

Day	Week	Weekday	Month	Date	Topic
1	1	Tues	Jan	8th	Introduction to the course
2	1	Thurs	Jan	10th	Introduction to R, introduction to GitHub
3	2	Tue	Jan	15th	R Intermediate Concepts
4	2	Thurs	Jan	17th	R Advanced Concepts
5	3	Tue	Jan	22nd	R Expert Concepts
6	3	Thurs	Jan	24th	Introduction to Morphometrics
7	4	Tue	Jan	29th	Continue with Morphometrics
8	4	Thurs	Jan	31st	Introduction to Building Phylogenies
9	5	Tue	Feb	5th	Continue with Phylogenies
10	5	Thurs	Feb	7th	Introduction to the Paleobiology Database (PBDB)
11	6	Tue	Feb	12th	Continue with PBDB
12	6	Thurs	Feb	14th	Modeling Ecological Gradients
13	7	Tue	Feb	19th	Continue with Ecological Gradients
14	7	Thurs	Feb	21st	Calculating Stratigraphic Range
15	8	Tue	Feb	26th	Continue with Stratigraphic Range
16	8	Thurs	Feb	28th	Introduction to Photogrammetry
17	9	Tue	Mar	5th	Continue with Photogrammetry
18	9	Thurs	Mar	7th	Collecting 3D Data
19	10	Tue	Mar	12th	Continue with 3D Data
20	10	Thurs	Mar	14th	TBD
	Finals	Mon	Mar	18th	In class, 1-3pm

Graduate Student Requirements (for 597Q)

All graduate students enrolled in the 597Q version of this course will be required to write a research proposal using methods explored in this course. While the project proposed does not have to be conducted, it should be a realistic and reasonable proposal, written in the style of a Geological Society of American graduate student research grant proposal. This assignment will be due at the same time as the class final (Monday, March 18th at 1pm). More information will be provided on this assignment at a later date.