

BIOL 5326 – Molecular and Phylogenetic Methods Fall 2022

Lecture Syllabus

INSTRUCTOR AND COURSE DESCRIPTION

Instructor: Dr. Thornton R. Larson

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Lectures: TR 2 PM – 1315 PM WSB 109

Course Description

The general purpose of this course is to bridge the knowledge gap between a genetics course and utilizing some of the methods covered within. We will go over in detail the what and how of current techniques in molecular phylogenetics, discuss recent works, and apply that knowledge to a project that, with some flexibility, you will design and implement.

The course is effectively divided into three distinct parts: Lecture only, where we will learn about databases, current techniques and literature; Some lectures with demonstration where we will continue the lecture and paper discussions, but one of the classes will be conducted in the molecular lab where I will demonstrate the methods we will be implemented in the lab; Last is purely lab time where you will sign up to use the lab to run your phylogenetic analysis using Sanger Sequencing techniques. Sanger is still commonly used today, though quickly being usurped by NextGen Techniques, but our budgeting allows us to explore it.

Required Materials

Elizabeth S. Allman, John A. Rhodes. *Lecture Notes: The Mathematics of Phylogenetics*. 2016. ([available here](#)); I will not directly follow this text. I will use it primarily and supplement it with other texts as I see fit.

We will utilize some primary literature and select chapters from other texts. Other texts will be provided to you in Blackboard or class.

Exams and Grading

1 Exam 100 pts

1 Proposal 100 pts

1 Final Paper 100 pts

1 Presentation 100 pts

Total Credit 400 points

A 90 – 100% B 80 – 89% C 70 – 79% D 60 – 69% F <60%

COURSE OBJECTIVES, LEARNING OUTCOMES, MARKETABLE SKILLS, POLICIES, AND UNIVERSITY SERVICES

Course Objectives: At the end of the semester, students will:

1. Understand some of the primary techniques of Phylogenetics.
2. Be able to complete analysis of phylogenetic data with original sequences.
3. Know the difference between different primers and enzymes.
4. Understand how the replication process works in a Polymerase Chain Reaction.

5. Be able to present information both in presentation and written formats.
6. Utilize databases to find primary literature to learn more about modern genetic techniques.

Student Learning Outcomes (SLOs) for Biology:

1. Demonstrate an understanding of evolution by natural selection.
2. Demonstrate an integration of environmental awareness into everyday modern life.
3. Understanding how to incorporate molecular biology into the study of the whole organism.
4. Demonstrate utilization of various field techniques toward addressing scientific questions in the discipline.
5. Conduct basic laboratory experiments utilizing standard observational strategies.

Marketable Skills

1. Ability to organize, analyze, and interpret data.
2. Experience in managing time and meeting deadlines.
3. Ability to speak effectively and write concisely about scientific topics.
4. Experience in the development of professional email correspondence.

Attendance:

Mandatory. No roll will be called, but this course is sized to where I will recognize when someone is not present. I am allowed to drop you from my class if you miss more than six times (that accounts for 2 full weeks of lecture). I do not wish to hear excuses for missing class, and do not want to hear about it every time you are gone. Absences are excused only if you have a documented, university approved excuse (hospitalization, funeral, etc.) DO NOT MISS EXAMS unless you have a documented, university-approved excuse. If you do not inform me of your approved absence before the exam it will be a ZERO. For labs, DO NOT MISS LAB PRACTICALS!!! It is impossible to re-run them as they are setup with many lab components that take up space that is not guaranteed.

SRSU Library Services

The Sul Ross Library offers FREE resources and services to the entire SRSU community. Access and borrow books, articles, and more by visiting the library's website, library.sulross.edu. Off-campus access requires your LoboID and password. Check out materials using your photo ID. Librarians are a tremendous resource for your coursework and can be reached in person, by email (srsulibrary@sulross.edu), or phone (432-837-8123).

SRSU Disability Services:

ADA (Americans with Disabilities Act) Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. Students seeking accessibility/accommodations services must contact Rebecca Greathouse Wren, LPC-S, SRSU's Accessibility Services Coordinator at 432-837-8203 (please leave a message and we'll get back to you as soon as we can during working hours), or email rebecca.wren@sulross.edu. Our office is located on the first floor of Ferguson Hall (Suite 112), and our mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas, 79832

ACADEMIC HONESTY:

The University expects all students to engage in all academic pursuits in a manner that is beyond reproach and to maintain complete honesty and integrity in the academic experiences both in and out of their classroom. The University may initiate disciplinary proceeding against a student accused of any form of academic dishonesty, including but not limited to, cheating on an examination or other academic work, plagiarism, collusion, and the abuse of resource materials. "Cheating" includes 1. Copying from another student's test paper, laboratory report, other report, or computer files, data, listings, and/or programs, or allowing another student to copy from same. 2. Using, during a test, materials not authorized by the person giving the test. 3. Collaborating, without authorization, using, buying, selling, stealing, transporting, soliciting, copying, or possessing, in whole or in part, the contents of a non-administered test. 5. Substituting for another student; permitting any other person, or otherwise assisting any other person to substitute for oneself or for another student in the taking of an examination or test or the preparation of academic work to be submitted for academic credit. 6. Bribing another person to obtain a non-administered test or information about a non-administered test. 7. Purchasing, or otherwise acquiring and submitting as one's own work any research paper or other writing assignment prepared by an individual or firm. This section does not apply to the typing of a rough and/or final version of an assignment by a professional typist. 8. "Plagiarism" means the appropriation and the unacknowledged incorporation of another's work or idea in one's own written work offered for credit. 9. "Collusion" means the unauthorized collaboration with another person in preparing written work offered for credit. 10. "Abuse of resource materials" means the mutilation, destruction, concealment, theft or alteration of materials provided to assist students in the mastery of course materials. 11. "Academic work" means the preparation of an essay dissertation, thesis, report, problem, assignment, or other project that the student submits as a course requirement or for a grade. 12. "Falsification of Data" means the representation, claim, or use of research, data, statistics, records, files, results, or information that is falsified, fabricated, fraudulently altered, or otherwise misappropriated or misrepresented. All academic dishonesty cases may be first considered and reviewed by the faculty member. If the faculty member believes that an academic penalty is necessary, he/she may assign a penalty but must notify the student of his/her right to appeal to the department chair, the dean and eventually, to the Provost and Vice President for Academic and Student Affairs before imposition of the penalty. At each step in the process, the student shall be entitled to written notice of the offence and/or of the administrative decision, an opportunity to respond, and an impartial disposition as to the merits of his/her case. The decision of the Provost and Vice President for Academic and Student Affairs shall be final.

I will reiterate here, I take academic dishonesty and plagiarism very seriously. Citations are your friend.

Classroom Climate of Respect

Importantly, this class will foster free expression, critical investigation, and the open discussion of ideas. This means that all of us must help create and sustain an atmosphere of tolerance, civility, and respect for the viewpoints of others. Similarly, we must all learn how to probe, oppose and disagree without resorting to tactics of intimidation, harassment, or personal attack. No one is entitled to harass, belittle, or discriminate against another on the basis of race, religion, ethnicity, age, gender, national origin, or sexual preference. Still we will not be silenced by the difficulty of fruitfully discussing politically sensitive issues.

Diversity Statement

"I aim to create a learning environment for my students that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, socioeconomic class, age, nationality, etc.). I also understand that the crisis of COVID, economic disparity, and health concerns, or even unexpected life events could impact the conditions necessary for you to succeed. My commitment is to be there for you and help you meet the learning objectives of this

course. I do this to demonstrate my commitment to you and to the mission of Sul Ross State University to create an inclusive environment and care for the whole student as part of the Sul Ross Familia. If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. I want to be a resource for you."

For Remote/Online Courses Only - SRSU Distance Education Statement.

Students enrolled in distance education courses have equal access to the university's academic support services, such as library resources, online databases, and instructional technology support. For more information about accessing these resources, visit the SRSU website. Students should correspond using Sul Ross email accounts and submit online assignments through Blackboard, which requires secure login. Students enrolled in distance education courses at Sul Ross are expected to adhere to all policies pertaining to academic honesty and appropriate student conduct, as described in the student handbook. Students in web-based courses must maintain appropriate equipment and software, according to the needs and requirements of the course, as outlined on the SRSU website. Directions for filing a student complaint are located in the student handbook.

TENTATIVE SCHEDULE

| | DATE | TOPIC | CHAPTER |
|----------------|--------------|---|---------|
| <i>Week 1</i> | | | |
| Lecture 1 | 8/23 | Allman and Rhodes Chapter 1 & Introduction to course | 1 |
| Lecture 2 | 8/25 | Fundamental Concepts: Paper Discussion will be in BB or announced | |
| <i>Week 2</i> | | | |
| Lecture 3 | 8/30 | Species Concepts and Tree Thinking | |
| Lecture 4 | 9/1 | Allman and Rhodes Chapter 2 & Paper Discussion | 2 |
| <i>Week 3</i> | | | |
| Lecture 5 | 9/6 | Allman and Rhodes Chapter 3: Paper Discussion | 3 |
| Lecture 6 | 9/8 | Allman and Rhodes Chapter 9: Paper Discussion | 9 |
| <i>Week 4</i> | | | |
| Lecture 7 | 9/13 | Allman and Rhodes Chapter 4 and 5 | 4 & 5 |
| Lecture 8 | 9/15 | Allman and Rhodes Chapter 6: Paper Discussion | 6 |
| <i>Week 5</i> | | | |
| Lecture 9 | 9/20 | Allman and Rhodes Chapters 7 and 8 | 7 & 8 |
| Lecture 10 | 9/22 | Allman and Rhodes Chapter 12: Paper Discussion | 12 |
| <i>Week 6</i> | | | |
| Lecture 11 | 9/27 | Allman and Rhodes Chapter 13: Paper Discussion | 13 |
| Demo 1 | 9/29 | Extractions | |
| <i>Week 7</i> | | | |
| Lecture 12 | 10/4 | Really basic Population, Conservation genetics Proposal due by 2 PM | |
| Demo 2 | 10/6 | MasterMix and PCR | |
| <i>Week 8</i> | | | |
| Lecture 13 | 10/11 | Genomics and the future | |
| Demo 3 | 10/13 | Cleanup | |
| <i>Week 9</i> | | | |
| Lecture 14 | 10/18 | E-DNA | |
| Demo 4 | 10/20 | Computational Analysis | |
| <i>Week 10</i> | | | |
| Lecture 15 | 10/25 | Character Evolution and Evolutionary diversification | |
| EXAM | 10/27 | Exam covers both material and demo including protocols | |
| <i>Week 11</i> | | | |
| | | Student lab signups | |
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| <i>Week 12</i> | | | |
| | | Student lab signups | |
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| | | Student lab signups | |
| <i>Week 13</i> | | Student lab signups | |
| | | Student lab signups | |
| | | Student lab signups | |
| <i>Week 14</i> | | | |
| Lecture 25 | 11/22 | Presentations: ppt due in BB by 2 PM | |
| No Class | 11/24 | THANKSGIVING HOLIDAY | |
| <i>Week 15</i> | | | |
| | 11/29 | Mandatory discussion to check understanding (individually scheduled meetings) | |
| No Class | 12/1 | DEAD DAY – NO CLASSES | |
| <i>Week 16</i> | | | |
| FINAL | 12/5 | FINAL PAPERS DUE IN MPE FORMAT BY 2PM | |
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