

BOT 6726/ZOO 6927
Principles of Systematic Biology
Spring 2019

Catalog Description

Theory of biological classification, taxonomy, nomenclature, and phylogenetics. Discussion of issues in systematic biology including species concepts and reticulate evolution. Laboratory experience in phylogenetic methods, including parsimony, maximum likelihood, Bayesian inference, divergence time estimation, and ancestral state reconstruction. Offered spring term in odd-numbered years.

Credit Hours

4

Course Objectives

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

- Describe the historical development of systematics research and theory
- Understand current issues related to classification, nomenclature, and species concepts
- Discuss the three major optimality criteria used in systematics research
- Design and execute phylogenetic and related analyses (e.g., molecular dating, historical biogeography, diversification)
- Explain various causes of incongruence among gene trees and species trees
- Create, edit, and critique Wikipedia pages in their area of specialty

Instructor Information

- Emily Sessa (521 Bartram; phone: 392-1098; e-mail: emilysessa@ufl.edu)
- Nico Cellinese (354 Dickinson; phone: 273-1979; e-mail: ncellinese@flmnh.ufl.edu)
- Guest Lecturer: Lucas Majure (379 Dickinson; phone: 273-1990; e-mail: lmajure@floridamuseum.ufl.edu)

Office hours are by appointment (email us!)

Course Meeting Time(s)

Lecture:	M W F	3rd period (9:35–10:25am)
Discussion/lab:	F	4-5th period (10:40–12:35)

Course Meeting Location(s)

Carr 222 (**NOT the rooms listed in One.UF!**)

Course Website

Course materials and related information will be posted on the course Canvas site. Students are responsible for all announcements made in class and/or posted on the website for this course.

Required Materials

Textbook or Other Readings

- *Tree Thinking, An Introduction to Phylogenetic Biology* Baum & Smith. W.H. Freeman, 2012.
- Additional readings from the primary literature will be posted as PDFs on Canvas.

Computation

- A laptop that you can bring to class
- A HiPerGator account (we will give you instructions on setting this up)

- A Wikipedia Education Account (we will give you instructions on setting this up)

Attendance Policy and Expected Conduct in Class

Students are expected to be on time for class, and attendance is mandatory, as is participation in discussions (indeed, participation is part of your grade – see below). In particular, you must be present for the exams, Wikipedia peer review discussion, ML vs. BI debate, and during all final presentations. Please contact the instructors at least a week in advance if you must be absent.

The policies for allowable absences and make-up work follow the university attendance policies: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>. The student will remain responsible for scheduling any make-up work with the instructor.

Only approved electronic devices may be used in class. Approved electronic devices are laptop computers (when used to take notes or otherwise participate in classroom activities) and voice recording devices. Unapproved electronic devices include cell phones, video recorders, digital cameras, and MP3 players.

Grading/Assessment

- Two exams: 20% each (40% total)
- Tau Ceti: 20% (one presentation and one written report)
- Wikipedia: 20% (draft and final writeup, publication online)
- Write-ups associated with the ML vs. BI debate: 10% (pre-debate and post-debate summaries)
- Participation: 10%

Grade based on total number of points, with 90% or above an “A”, 89-80% a “B”, 79-70% “C”, 69-60% a “D”, and below failing; plus and minus grades will be used. **Note that graduate students must maintain a 3.0 GPA to graduate.**

Exams: Exams are held in class during a discussion period and will be in short answer format.

Tau Ceti Project: Students will complete a project based on a fictional group of organisms found on the imaginary planet Tau Ceti. Students will score these organisms for morphological and other traits, and will be provided with synthetic DNA sequence and chromosome count data. Students will conduct a standard set of phylogenetic analyses based on this information, and then can choose one of several additional topics to focus on (e.g., historical biogeography, trait evolution). Students will complete a written report documenting their analyses and results, and will give a presentation on the same to the class during the final days of the semester.

Wikipedia: Students will work with the Wikipedia Education Foundation to learn how to create, edit, and publish articles on Wikipedia. Each student will complete a Wikipedia article on a topic of their choice (broadly related to the fields of taxonomy and/or systematics), participate in peer review with another student in the class, and take part in a final discussion on this project.

ML vs. BI debate: During one class period we will have a debate on relative merits and challenges of the maximum likelihood and Bayesian inference optimality criteria used in phylogenetics. Students will be assigned to one of these two teams and will be responsible for writing a summary (up to 1 page) of their team’s side to be handed in before the debate, as well as a post-debate reflection (also 1 page) to be handed in after the debate has taken place.

Participation: Students are expected to participate in discussions, debates, laboratory activities, and active learning exercises throughout the semester.

Grade Curve Policy

No curve will be applied to any assessment.

Make-up Policy

Make-up exams will only be offered in extreme need; please communicate with the instructors.

Honesty Policy

- All students registered at the University of Florida have agreed to comply with the following statement: *"I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."*
- In addition, on all work submitted for credit the following pledge is either required or implied: *"On my honor I have neither given nor received unauthorized aid in doing this assignment."*
- If you witness any instances of academic dishonesty in this class, please notify the instructor or contact the Student Honor Court (392-1631) or Cheating Hotline (392-6999). For additional information on Academic Honesty, please refer to the University of Florida Academic Honesty Guidelines at: <http://www.dso.ufl.edu/judicial/procedures/academicguide.html>.

UF Counseling Services

- Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
 - UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
 - Career Resource Center, Reitz Union, 392-1601, career and job search services.
- Many students experience test anxiety and other stress related problems. "A Self Help Guide for Students" is available through the Counseling Center (301 Peabody Hall, 392-1575) and at their web site: <http://www.counsel.ufl.edu/>.

Accommodation for Students with Disabilities

- Students who will require a classroom accommodation for a disability must contact the Dean of Students Office of Disability Resources, in Peabody 202 (phone: 352-392-1261). Please see the University of Florida Disability Resources website for more information at: <http://www.dso.ufl.edu/drp/services/>.
- It is the policy of the University of Florida that the student, not the instructor, is responsible for arranging accommodations when needed. Once notification is complete, the Dean of Students Office of Disability Resources will work with the instructor to accommodate the student.

Software Use

All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

U Matter, We Care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is

committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Basic Needs and Security

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in this or any other course, is urged to contact the Dean of Students for support (<https://dso.ufl.edu>). Please also notify the professor if you are comfortable in doing so.

UF has a food pantry on campus (located near the HUB) that is available to all students. No proof of need is required; all you need is a UF ID card. Field & Fork Food Pantry:
<https://pantry.fieldandfork.ufl.edu/>

Course Evaluation Policy

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

Course Schedule (Subject to Change)

Date	Instructor		Topic	Reading
Week 1				Ch. 1, 2, 3
7-Jan	Nico	Lecture	Introduction to cladistics and “tree-thinking”, contributions of Darwin and Hennig (with definitions of basic terms)	
9-Jan	Nico	Lecture	Introduction to characters, homology decisions, states and their delimitation; ordering character states in transformation series;	
11-Jan	Nico	Lecture & Discussion	Polarity decisions, the outgroup method; Rooting networks; brief survey of other methods of polarizing characters Discussion of characters, alignment, states, etc.	
Week 2				Ch. 4, 5
14-Jan	Nico	Lecture	Classification construction	
16-Jan	Nico	Lecture	Biological nomenclature and Phylogenetic Taxonomy	
18-Jan	Nico	Lecture & Discussion	Intro to species and speciation; Introduce Wikipedia project and Tau Ceti	
Week 3				
21-Jan	—	—	NO CLASS – Martin Luther King, Jr. Day	
23-Jan	Nico	Lecture	Species concepts	
25-Jan	Nico	Lecture & Discussion	Discussion on species concepts	
Week 4				Ch. 7, 8
28-Jan	Emily	Lecture	Optimization criteria; maximum parsimony	
30-Jan	Emily	Lecture	Tree-searching methods; distance methods (NJ & UPGMA)	
1-Feb	Emily	Lab	HPG and Command line Basics	
Week 5				
4-Feb	Emily	Lecture	Supertrees and supermatrices	
6-Feb	Emily	Lecture	Sequence alignment; BLAST	
8-Feb	Emily	Lab	Alignment and Parsimony	
Week 6				
11-Feb	Emily	Lecture	Maximum likelihood methods	
13-Feb	Emily	Lecture	Models of nucleotide evolution	
15-Feb	Emily	Lab	ML	
Week 7				
18-Feb	Nico	Workday	Tau Ceti workday	
20-Feb	Nico	Workday	Wikipedia workday: Peer review	
22-Feb	Nico	EXAM	EXAM (on weeks 1-6)	

Week 8				Ch. 9
25-Feb	Emily	Lecture	Bayesian inference in phylogenetics	
27-Feb	Emily	Lecture	Assessing clade support and conflict	
1-Mar	Emily	Lab	PartitionFinder and BI	
Week 9				
4-6 Mar			SPRING BREAK	
Week 10				Ch. 6
11-Mar	Lucas	Lecture	Hybridization, polyploidy, and reticulation	
13-Mar	Lucas	Lecture	Gene tree vs. species tree reconciliation	
15-Mar	Lucas	Lab	Gene Trees/Species trees	
Week 11				
18-Mar	Emily	Lecture	Diversification rates	
20-Mar	Emily	Lecture	Divergence time estimation	
22-Mar	Emily	Lab	Diversification; Introduce ML vs. BI debate	
Week 12				Ch. 10, 11
25-Mar	Emily	Lecture	Divergence time estimation, cont.; Biogeography	
27-Mar	Nico	Lecture	Phylogeography	
29-Mar	Emily	Lab	Dating and biogeography	
Week 13				
1-Apr	Emily	Lecture	Community Phylogenetics	
3-Apr	Nico	Lecture	Informatics	
5-Apr	Emily	Lab	Community phylogenetics	
Week 14				
8-Apr	Emily	Debate	Debate: ML vs BI	
10-Apr	Emily	Workday	Tau Ceti workday	
12-Apr	Emily	EXAM	EXAM (on weeks 8-13)	
Week 15				
15-Apr		Presentations	Wikipedia Finale	
17-Apr		Presentations	Tau Ceti presentations	
19-Apr		Presentations	Tau Ceti presentations	
Week 16				
22-Apr		Presentations	Tau Ceti presentations	
24-Apr		Presentations	Tau Ceti presentations	