

BISC 599: Phylogenetics and Evolution

Units: 2

Fall 2018 - Mondays, 10-11.50 am

Location: Room ZHS 360

Instructor: Dr. Trond Sigurdson

Office: ZHS 256

Office Hours: Mondays 11am - 2pm

Contact info: sigurdse@usc.edu (emails will be responded to within 48 hours)

Course Description

BISC 599 will cover the methods used in order to infer phylogenetic relationships between organisms. The class is appropriate for graduate students within biology or human biology. We will start by discussing underlying biological philosophies of relationships such as the contrast between phenetics and cladistics. The use of morphological data versus molecular sequences will also be discussed. Students will further learn to interpret cladograms and phylogenetic trees, and how to produce such trees. Then we will move on to study the methods of using phylogenetic algorithms such as parsimony, Bayesian inference, and maximum likelihood.

Learning Objectives

BISC 599 will make the students proficient in the theory and practice of phylogenetic analyses in biological studies. They are expected to understand the use of such analyses in evolutionary studies. Rather than keeping everything theoretical, students will be required to create phylogenetic trees to work out the interrelationships between groups of higher taxa, species, or populations, given a set of data. This hands-on part of the course will primarily focus on the Phylogenetic Analyses Using Parsimony (PAUP) software.

Recommended Preparation: BISC 120 or HBIO 200

Course Notes

Each lecture is a combination of topics presented by the Instructor, as well as a seminar-type discussion. Students are expected to take active part in these discussions. Lectures will not be recorded, but any Powerpoint slides used will be posted on Blackboard. However, these do not contain all the information needed, so it is very important to come to the lectures, take notes, and participate in class.

Required Literature

Wiley and Liberman, 2011. *Phylogenetics: Theory and Practice of Phylogenetic Systematics*. 2nd Edition. Additional readings will be provided in class (printouts).

Grading Breakdown

Assignment	% of Grade
Participation in class discussions	15%
Homework assignments	30%
Midterm Exam	20%
Final Exam	35%

Grading Scale

Course final grades will be determined using the following scale

A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	59 and below

Assignment Submission Policy

Homework assignments should be printed and given to the Instructor one week after the assignment was announced.

Grading Timeline

The graded assignments will be handed back to the student after one week. Final grades will be set four days after the final exam.

Course Schedule:

Time	Topic	Readings	Assignment due
Week 1 (Aug 20)	Introduction to systematics and phylogenetics, phenetics & cladistics	Chapter 1	
Week 2 (Aug 27)	Species and speciation	Chapter 2	Homework 1
Week 3 (Sep 3)	No class; Labor Day		
Week 4 (Sep 10)	Hennig. Monophyly, paraphyly, polyphyly	Chapter 3	Homework 2
Week 5 (Sep 17)	Cladograms. Rooting trees, nodes, polytomies	Chapter 4	
Week 6 (Sep 24)	Character apomorphies, homologies, homoplasies. Convergent evolution	Chapter 5	
Week 7 (Oct 1)	Parsimony, finding optimal trees, branch lengths, bootstrapping	Chapter 6	Homework 3
Week 8 (Oct 8)	MIDTERM EXAM, 10 am		
Week 9 (Oct 15)	Bayesian inference and maximum likelihood in phylogenetic analyses. Using phylogenetic software	Chapter 7, printout	
Week 10 (Oct 22)	Classification, naming taxa, and the Phylocode	Chapter 8	Homework 4
Week 11 (Oct 29)	Biogeography and phylogenetics	Chapter 9	
Week 12 (Nov 5)	Biogeography continued. Statistical methods	Chapter 9	
Week 13 (Nov 12)	Fossils and phylogenetics. Using fossil collections and type specimens	Chapter 10	Homework 5
Week 14 (Nov 19)	Examples of phylogenetics, fossils, and macroevolutionary hypotheses	See printout	
Week 15 (Nov 26)	Macroevolutionary hypotheses cont. Phylogenetics in published literature.	Chapter 11	Homework 6
Week 16 (Dec 3)	Study Day, no class		
December 10	FINAL EXAM, 8 am		

Course Policies

- 1) Exam dates are firm. There are no makeup exams in the course. Performance on the final may be prorated to substitute for a missing midterm exam, if an excuse considered valid by faculty is presented in a timely fashion. An acceptable written excuse or documentation must be provided to the Instructor.
- 2) The midterm exam will be returned to students by the professor during lectures. The final examination will not be returned but will be retained for one semester by the faculty.
- 3) Regrades: If you think an answer you have provided was graded incorrectly or if there is an arithmetic error, you may seek a regrade. You must provide a written explanation of why you think your answer was graded incorrectly. If a regrade is agreed upon, then the ENTIRE EXAMINATION may be subject to a regrade. Your grade may therefore go up, go down, or remain the same. Regrade requests must be received within one week of when the midterm exam is returned to the students, or by the second week of classes the following semester for the final exam.
- 4) No special assignments for extra credit are permitted.
- 5) Academic integrity policies of the University will be strictly followed (see below). Infractions can result in severe penalties. There may be assigned seating for exams. No student may be admitted to an exam after the first student has left the exam.
- 6) It may be necessary to make adjustments to the syllabus during the semester. Check the course website or class announcements on Blackboard for updates.

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or report a crime.

Provides overall safety to USC community. dps.usc.edu