

Syllabus – BIOS 659

Advanced Studies in Genetics: Molecular Evolution & Phylogenetics (MEP)

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Class meets:

Tuesdays & Thursdays, 9:30-10:45am in Nursing 334.

Overview

Molecular Evolution & Phylogenetics (MEP) is a graduate-level course emphasizing both the theory and practice of reconstructing evolutionary history using molecular data. We will explore:

- 1) The major approaches to evolutionary reconstruction and hypothesis testing.
- 2) The historical phylogenetic controversies and philosophical arguments.
- 3) Various models of evolution for inferring rates of substitutions.
- 4) Estimating and using molecular clocks to test hypotheses about divergence times, rates, etc, and recent controversies surrounding molecular clocks.
- 5) Using relative substitution rates to test hypotheses about the activity of Darwinian and purifying selection.
- 6) Various approaches to determining the accuracy and robustness of evolutionary reconstructions (bootstrapping, statistical tests, etc).
- 7) Genetic polymorphism and population trees.
- 8) Computational approaches: Using computer tools (desktop and cluster-based) in evolutionary reconstructions.

MEP will feature an interactive lecture format with guest presentations, hands-on demonstrations, and an emphasis on applying new knowledge to novel explorations of your data.

Course information and computational resources can be accessed at <http://egg.isu.edu>.

Topics covered

Please see attached schedule. Coverage and dates are subject to change.

Prerequisites

A background in molecular genetics and experience with biological computing will be helpful but not essential.

Textbook & References

Required

- Masatoshi Nei & Sudhir Kumar, *Molecular Evolution & Phylogenetics*, Oxford University Press, 2000, ISBN: 0-19-513585-7 (about \$65). This book is available from OUP online (<http://www.oup.com/us/>), Amazon, and elsewhere.

Optional

- Joseph Felsenstein, *Inferring Phylogenies*, Sinauer, 2004, ISBN: 0-87893-177-5– this book provides informatics on certain phylogenetic methods not covered by Nei, such as Bayesian approaches. I'll be providing electronic copies of useful chapters as needed, but it's still worth having on your bookshelf.
- Roderic D. Page & Edward C. Holmes, *Molecular Evolution: A phylogenetic approach*, Blackwell Science, 1998, ISBN: 0-86542-889-1 – a classic in the field and full of useful information.

Grading

Your grade will consist of the following components, weighted as shown:

Final Assignment	30%
Assignments (6)	60%
Participation, intangibles	10%

Final letter grades depend upon the overall performance and may be adjusted upward.

Final Exam

The Final Exam will be take-home, open-book format. Students will have 1 week to complete the exam. The exams will feature problems to be solved using informatics, tools, and approaches covered in the class. Students will work alone (i.e., not in collaboration with other students).

Assignments

Six (6) homework assignments will be assigned. These will consist of problems to be solved using informatics, tools, and approaches covered in the class, providing practice on some of the major concepts in the class. Students will work alone (i.e., not in collaboration with other students).

Late policy

Assigned work in this course must be turned in by the specified due date. Late work will **not** be accepted.