

COURSE SYLLABUS

Fundamentals of Evolution Lab, 11:216:252

Time: Mondays 9:15 AM-12:15 PM (section 1), 12:35-3:35 PM (section 2).

Place: 193 Foran Hall, Cook Campus (except prearranged field trips and computer labs).

Instructors: Dr. Siobain Duffy

Dr. Lena Struwe

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Credits: 1 (one 2-period lab/week)

Course Prerequisites: [11:119:101 and 11:119:102], or [11:119:115 and 11:119:116], or [11:216:101]. Co-requisite 11:216:251.

Course Description: This is the companion lab to the class Fundamentals of Evolution (11:216:251). The lab includes hands-on activities indoors and outdoors to investigate, test, reconstruct, and observe evolution in a broad sense. Major topics will be phylogenetic reconstruction, species concepts and boundaries (including DNA barcoding), population evolution, and evolution at the molecular level.

Learning Goals for Lab:

1. Understanding of phylogenetic reconstruction based on molecular data using freely available software.
2. Understanding and performance of the principles of PCR and DNA sequencing, and the use of DNA barcodes to identify species.
3. Understanding the role of mutations and variations in phenotype and genotype in natural selection and other evolutionary processes.
4. Ability to investigate evolutionary processes in the past and present based on modern scientific techniques.

Course text: The Fundamentals of Evolution textbook and Lab manual texts (available online at course website: ecollege.rutgers.edu), including excerpts from primary literature, data sets, software manuals, lab protocols, and contemporary press. **BRING YOUR TEXTBOOK TO CLASS.**

Course Requirements and Assignments: There is mandatory attendance for all course components. Written, detailed and well-thought-out individual lab reports are due at the end of each lab. Students will present results to each other through oral summaries during lab.

Plant Molecular Evolution In-class lab project: Select a plant, identify it, extract its DNA, run PCR, sequence a DNA fragment, use the sequence for DNA barcoding (taxon identification or confirmation), download sequences from Genbank, DNA alignment, run phylogenetic analysis using parsimony and maximum likelihood, evaluate results, write a

scientific discussion (see lab material on the course website). For this project you work in pairs, but hand in separate project reports. The lab project on Plant Molecular Evolution requires the keeping of a detailed lab notebook that will be graded for accuracy and neatness at the end of class, and a final presentation, as well as a final report.

Examinations and Grading: Grading will be based on:

Lab reports	80 pt (10 pt/lab for 8 labs)
Plant Molecular Evolution Project (oral)	20 pt
Plant Molecular Evolution Project (written report)	40 pt
Plant Molecular Evolution Project (Lab Notebook review)	20 pt
<u>Attendance and participation</u>	<u>40 pt</u>
Total	200 pt

Final letter grades will be based on: 90-100% (A), 85.1-89.9% (B+), 80-85% (B), 75-79.9% (C+), 70-74.9 (C), 60-69.9 (D).

Schedule

Classification, evolutionary trees, and characters

Fossils and geological time

Field trip: Geology Museum

Meet at 85 Somerset Street, New Brunswick, NJ 08901

Mutation and Drift

Population Evolution

Plant Biodiversity

Field trip: Floraculture greenhouse

Meet at 64 Nichol Ave, New Brunswick, NJ 08901 (map on course website)

Plant Molecular Evolution Project I: DNA extraction

Spring Break

Plant Molecular Evolution Project II: PCR

Plant Molecular Evolution Project III: Electrophoresis, GenBank

Plant Molecular Evolution Project IV: DNA Sequence data, alignment, phylogenetic and DNA barcoding analyses

Meet at Foran 124 (computer lab)

Plant Molecular Evolution Project V: DNA Sequence data, alignment, phylogenetic and DNA barcoding analyses, continued

Meet at Foran 124 (computer lab)

Plant Molecular Evolution Project VI: Results and discussion

Plant Molecular Evolution Project VII: Results and discussion, continued

Plant Molecular Evolution Project VIII: FINAL PRESENTATION

DEADLINE for PROJECT REPORT (upload in Dropbox)

DEADLINE for LAB NOTEBOOK REVIEW (hand in at lab).