Instructor Information

Instructor: Oliver Gailing, PhD, Assistant Professor
Office Location: 167 Noblet
Telephone: Office – (906)487-1615
E-mail: ogailing@mtu.edu
Office Hours: Tuesday 9 am- noon, 2pm to 4 p.m. or by appointment

Course Identification

Fall 2010 – 3 credits, Michigan Technological University
Course Number: FW 5340
Course Name: Forest Genetics
Course Location: Noblet building
Class Times: MWF 11:05am – 12:05pm
Prerequisites: none

Course Description/Overview

Audience: Graduate students and undergraduate students with some background in
genetics in Forest Resources & Environmental Science and Biological Sciences

Course description: The course will highlight population genetic topics and deals with the
effects of evolutionary factors (e.g. mutation, migration, gene flow, genetic drift, selection
and adaptation) on genetic diversity. In the first part of the course basics of genetics and
DNA markers techniques are introduced. Basic principles in population genetics
(measurement of genetic variation, the Hardy Weinberg Model, changes in genetic
variation patterns by mutation, gene flow, genetic drift and natural selection) will be
presented by means of case studies in temperate and tropical forest trees. The relevance of
genetic variation patterns for the future management and conservation of forests is
stressed. The course covers important topics in population genetics. Genetic variation is
affected directly or indirectly by human activities. It is important to understand how these
activities affect the ability of forest tree populations to adapt to temporally varying and
heterogeneous environmental conditions.

Hands-on experience: Student will have the opportunity to be directly involved in
ongoing projects in the Forest Genetics Lab. The acquired knowledge can be used to
analyze and interpret real data. The students will get hands-on experience in the isolation of DNA and in Polymerase Chain Reaction (PCR) based marker techniques.

**Learning objective:** Understand the basic principles of forest genetics and the relevance of genetic variation for the long-term adaptability in forest tree populations.

**Recommended text:**


**Course Resources**

**Course Website(s)**
- Personal Website <http://forest.mtu.edu/faculty/gailing/>

**Course Fees**
none

**Course Supplies**
none

**Grading Scheme**

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percentage</th>
<th>Grade points/credit</th>
<th>Rating</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>90% &amp; above</td>
<td>4.00</td>
<td>Excellent</td>
</tr>
<tr>
<td>AB</td>
<td>85% – 89%</td>
<td>3.50</td>
<td>Very good</td>
</tr>
<tr>
<td>B</td>
<td>80% – 84%</td>
<td>3.00</td>
<td>Good</td>
</tr>
<tr>
<td>BC</td>
<td>75% – 79%</td>
<td>2.50</td>
<td>Above average</td>
</tr>
<tr>
<td>C</td>
<td>70% – 74%</td>
<td>2.00</td>
<td>Average</td>
</tr>
<tr>
<td>CD</td>
<td>65% – 69%</td>
<td>1.50</td>
<td>Below average</td>
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<tr>
<td>D</td>
<td>60% - 64%</td>
<td>1.00</td>
<td>Inferior</td>
</tr>
<tr>
<td>F</td>
<td>59% and below</td>
<td>0.00</td>
<td>Failure</td>
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</tbody>
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**Grading Policy**

Grades will be based on the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Short presentation</td>
<td>100</td>
</tr>
<tr>
<td>Quizzes</td>
<td>600</td>
</tr>
<tr>
<td>Paper reviews</td>
<td>320</td>
</tr>
<tr>
<td>Class attendance/participation</td>
<td>300</td>
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<tr>
<td><strong>Total Points</strong></td>
<td><strong>1320</strong></td>
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**Quizzes:** Quizzes are based on previous lectures and exercises. Please bring your calculators. You may submit questions of your own that may appear in the quiz. There are a total of 7 quizzes. For each quiz **100 points** can be obtained. If all quizzes are taken, the lowest will be dropped. A total of **600 points** can be obtained.

**Short presentation:** The presentation will be on a short journal article or on a short book chapter (5 to 10 minutes).

**Paper reviews:** (due September 3rd, October 5th): Each student will review **two** short scientific articles from a journal about ecological genetics. The review should include a correct citation of the article and the senior authors’ affiliations (**10 points**), a summary of the main results and conclusions (**30 points**), the importance and significance of the paper (**30 points**), a summary of the methods that were used (**30 points**). Please explain which parts are difficult to understand and why (**30 points**), and which open questions remain and which future research directions can be derived (**30 points**). Each part should be addressed in only 3 to 4 sentences. A total of **320 points** can be obtained (**160 points** per paper review).

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**Course Policies**

Make-up exams will only be allowed for students who provide a written excuse. It is expected that each class session is attended.

**Collaboration/Plagiarism Rules**

Cell phones, Blackberries and iPods are not to be used in the classroom. Please make sure to bring a calculator with you to class.
University Policies

Academic regulations and procedures are governed by University policy. Academic dishonesty cases will be handled in accordance the University's policies.

If you have a disability that could affect your performance in this class or that requires an accommodation under the Americans with Disabilities Act, please see me as soon as possible so that we can make appropriate arrangements. The Affirmative Action Office has asked that you be made aware of the following:

Michigan Tech complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office, at 487-2212. For other concerns about discrimination, you may contact your advisor, department head or the Affirmative Action Office, at 487-3310

Academic Integrity:
http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html

Affirmative Action:
http://www.admin.mtu.edu/aaof

Disability Services:
http://www.admin.mtu.edu/urel/studenthandbook/student_services.html#disability

Equal Opportunity Statement:

Tentative Course Schedule

Week 1
M 8/30 Course introduction
   General introduction – Forest Genetics
W 9/1 Basics of genetics I
F 9/3 Basics of genetics II

Week 2
W 9/8 Molecular markers I

Week 3
M 9/13 Molecular markers II
W 9/15 Lab exercise – DNA isolation
F 9/17  Lab exercise – Gel electrophoresis

Week 4
M 9/20  Molecular markers - Quiz

W 9/22  Mendelian Genetics
F 9/24  Lab exercise – PCR I

Week 5
M 9/27  Genetic variation I

W 9/29  Genetic variation II
F 10/1  Lab exercise –PCR II

Week 6
M 10/4  Genetic variation – problems and exercises

W 10/6  Mendelian Genetics and genetic variation - Quiz

F 10/8  Lab exercise – Capillary electrophoresis

Week 7
M 10/11 Evolution – mutation, migration, gene flow

W 10/13 Evolution - speciation

F 10/15 Lab exercise –Capillary electrophoresis -Data analysis

Week 8
M 10/18 Evolution - exercise

W 10/20 Evolution - Quiz

F 10/22 Lab exercise - Data analysis -Population Genetic software

Week 9
M 10/25 Mating system

W 10/27 Mating System –exercises

F 10/29 Lab exercise - project work
<table>
<thead>
<tr>
<th>Week 10</th>
<th>M 11/1</th>
<th>Mating system - Quiz</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>W 11/3</td>
<td>Conservation genetics - Inbreeding</td>
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<tr>
<td></td>
<td>F 11/5</td>
<td>Lab exercise – project work</td>
</tr>
<tr>
<td><strong>Week 11</strong></td>
<td>M 11/8</td>
<td>Conservation genetics - Inbreeding –exercises</td>
</tr>
<tr>
<td></td>
<td>W 11/10</td>
<td><strong>Conservation genetics - Inbreeding - Quiz</strong></td>
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<tr>
<td></td>
<td>F 11/12</td>
<td>Lab exercise - project work</td>
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<tr>
<td><strong>Week 12</strong></td>
<td>M 11/15</td>
<td>Conservation genetics- Genetic drift</td>
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<tr>
<td></td>
<td>W 11/17</td>
<td>Conservation genetics- Genetic drift –exercises</td>
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<tr>
<td></td>
<td>T 11/18</td>
<td><strong>Conservation genetics – Genetic drift - Quiz</strong></td>
</tr>
<tr>
<td><strong>Week 13</strong></td>
<td>M 11/29</td>
<td>Selection and adaptation I</td>
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<tr>
<td></td>
<td>W 12/1</td>
<td>Selection and adaptation –exercises</td>
</tr>
<tr>
<td></td>
<td>F 12/3</td>
<td>Lab exercise – project work</td>
</tr>
<tr>
<td><strong>Week 14</strong></td>
<td>M 12/6</td>
<td><strong>Selection and adaptation - Quiz</strong></td>
</tr>
<tr>
<td></td>
<td>W 12/9</td>
<td>Summary and Quiz</td>
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