Course Description

Ecological research focuses on the dynamics of complex systems with quantitative models with the main purpose of synthesizing knowledge, explaining observations, uncovering patterns and processes, and to forecast future system behavior. In this course, students are introduced to the basic principles of quantitative ecological modeling based on a step-by-step and hands on approach to model development. Student will have the opportunity to develop conceptual and quantitative models for natural systems, analyze structure of different types of models ranging from statistical models (e.g. regression models) to ecological models (e.g. predator-prey interactions, species competition, population growth). The course does not have pre-requisites, but because of the nature of the topic of the course, students should be prepared to work in a quantitative framework throughout the semester.

Course Objectives

Upon completion of the course, students should:

- Be familiar with concepts related to model conceptualization, model structure, and modeling processes such as verification, evaluations, and validation.
- Be able to recognize and implement appropriate methodology and analysis to address research questions related to population and community ecology.
- Understand the scientific method as applied to scientific research in ecological modeling, including problem formulation, data collection, and model development.

Program Learning Outcomes

The course is designed to address the following Program Learning Outcomes, as given in the Bachelor of Science in Forestry Program Matrix:

1. Demonstrate understanding and competency of forest ecology and biology;

2. Demonstrate understanding and competency in the measurement of forest resources;
3. Demonstrate understanding and competency in managing forest resources;

4. Demonstrate understanding and competency of forest resource policy, economics, and administration.

5. Demonstrate understanding and competency in oral and written communication skills.

Items #1 - #4 above are required by the Society of American Foresters, the program's accrediting agency.

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**B.S. Forestry Program Learning Outcomes**

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<tr>
<th>Forestry Common Core</th>
<th>PLO 1</th>
<th>PLO2</th>
<th>PLO3</th>
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<td>Course</td>
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<td>Forest Ecology &amp; Biology</td>
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<td>Forest Resource Measurement</td>
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<td>Forest Resource Policy, Economics, Administration</td>
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<td>GIS 415</td>
<td>Intermediate</td>
<td>Advanced</td>
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**Student Learning Outcomes**

Upon completion of the course, students will:

a. Foundational knowledge.

- have a clear understanding of the most current issues and topics in ecological modeling.

- have a clear understanding of major concepts related to the design and implementation of scientific research.

- be able to formulate valid criteria for the selection of the appropriate techniques to address specific goals in modeling wildlife population ecology, conservation, and management.
b. Application.

- be able to find information on and analyze current topics in ecology.
- be able to identify current knowledge gaps and needs in the body of knowledge related to ecological modeling.

c. Integration.

- identify the interactions between modeling, ecology, and other realms of knowledge.

d. Human dimension.

- be able to identify ways in which one's or someone else's personal life could affect or be affected by implementation of models in wildlife population ecology, conservation and management actions.
- be able to intelligently discuss important issues in ecological modeling with other professionals and laymen.

e. Future learning.

- be familiar with a number of popular scientific journals and other sources of knowledge about ecological modeling.

**Grading**

Grades in this class will be based on a combination of three exams.

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<td>Mid-term 1</td>
<td>200</td>
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<td>Labs</td>
<td>200</td>
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<td>Final exam (cumulative)</td>
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<td><strong>Total</strong></td>
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**Course grades will be given according to the following scale:**

- A = 90-100 %
- B = 80-89 %
- C = 70-79 %
- D = 60-69 %
- F = 0-59 %
Textbook and readings

- Supplementary reading material will be provided by the instructor in the form of handouts or pdf files posted in D2L.

Course requirements

Knowing and understanding the material presented and discussed in lectures is the keystone for successfully completing this course. As the instructor of this course I commit myself to being knowledgeable on all the topics that we will cover in class and being well prepared to lecture about them. For that reason, I expect all students to have perfect attendance and be well prepared for class (i.e. read all assignments and review notes from lectures).

Written Assignments

- exams: Two term exams and a final exam have been scheduled for the semester. Each exam will include questions from topics covered during lectures and readings assigned during the semester. Students will get credit based on accuracy and clarity of their answers.

Responsible Use of Technology

It is expected that all students will only use cell phones, PDAs, laptop computers, MP3 players and other technology outside of class time or when appropriate in class. Answering a cell phone, texting, listening to music or using a laptop computer for matters unrelated to the course may be grounds for dismissal from class or other penalties.

Classroom Behavior

Disruptive, distracting, or disrespectful behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic, or other penalties. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom.

Other policies

All of the students in this class and in the Arthur Temple College of Forestry and Agriculture are expected to conduct themselves in an ethical and professional manner. For professionals in natural
sciences, the Ecological Society of America has established a Code of Ethics to which these professionals are expected to adhere. I strongly encourage you to read and abide by these guidelines, available at http://www.esa.org/aboutesa/codeethics.php.

**Academic Integrity (A-9.1)**

Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

**Definition of Academic Dishonesty**

Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to 1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; 2) the falsification or invention of any information, including citations, on an assigned exercise; and/or 3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are 1) submitting an assignment as if it were one’s own work when, in fact, it is at least partly the work of another; 2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and 3) incorporating the words or ideas of an author into one’s paper without giving the author due credit. Please read the complete policy at http://www.sfasu.edu/policies/academic_integrity.asp.

**Withheld Grades Semester Grades Policy (A-54)**

Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

**Students with Disabilities**

To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/.
**Lecture**

Week 1: Basics of R. Installation and administration, language, data import and export.

Week 2: Basics of R. Installation and administration, language, data import and export.

Week 3: Model conceptualization. Research question and identification of system of interest. Qualitative models.


Week 7: Modeling processes: verification, evaluation, validation.

Week 8: Modeling processes: verification, evaluation, validation.

Week 9: Modeling processes: verification, evaluation, validation.


Week 11: Population growth models.

Week 12: Occupancy models. Occupancy and detection probabilities.

Week 13: Predator/prey and competition models.

Week 14: Compartment (community) models.