This course proposal form should be completed when introducing a new course or a revision of an existing course. The proposal will be reviewed by the Committee on Curriculum, or, in the case of minor revisions, will be approved administratively by the Associate Provost for Instruction.

**This Course Proposal must be completed according to the guidelines provided in Course Proposal Form – Instructions and Guidance. Please see the last page of Course Proposal Form – Instructions and Guidance, for instructions on how this Course Proposal should be submitted to the Committee on Curriculum for review.**

Date: 09/18/2020

1. **Course Information:**

1.1 Course Prefix and Number: ERE533
Course Title: Ecological Modeling
(If a *new or renumbered* course, please check with the Registrar regarding the use or reuse of the course number)

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<td>This is a New Course.</td>
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<td>This is a Minor Course Revision</td>
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If this is a Course Revision, please see Course Proposal Form – Instructions and Guidance to determine if your revision is major or minor. Indicate below the reason(s) for the revision.

(Please check all that apply)

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<td>Credit hours</td>
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<td>Pre- or Co-requisite(s)</td>
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<td>☐</td>
<td>Format</td>
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1.3 General Education knowledge and skills area (if applicable): If none, check here ☒

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<td>American History</td>
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<td>The Arts</td>
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<td>Basic Communication</td>
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</table>
2. **Proposer Need Statement:**

2.1 Describe why this course (or course revision) is needed to meet current or proposed goals and outcomes of the program or College, and, if a revision, provide an explanation of and justification for the revision. This course has been taught as a special topics class for the past two years. Students who take this course will learn the fundamental mathematical skills necessary to develop a numerical model. This course meets the goals of the department of Environmental Resources Engineering (ERE) by introducing students to the modeling sciences and applying those sciences to natural systems. The course is an elective for students in the different study areas in the ERE graduate program and also serves as an engineering or technical elective for students in the ERE undergraduate program.

2.2 List the pre-requisite or co-requisite courses (taught within the home department or taught by another department) and explain their relationship to the proposed course. Prerequisite: ERE335 Numerical and Computing Methods or equivalent. I ask students to program extensively in this course, so require that the students have been introduced to a programming language and the general concepts of programming before taking this class.

2.3 Explain the impact of this course in meeting the goals and outcomes of other Departments/programs (if any). None

2.4 If the proposed course is designed to fulfill SUNY General Education Requirements, the Associate Provost for Instruction must review this proposal to ensure that General Education Requirements will be met for the specified knowledge area (See Instructions and Guidance). Please provide an explanation of how this course fulfills SUNY General Education Requirements.

2.5 What are the staffing requirements (instructor, TA, Lab tech, etc.) for this course? If a new course, are there new staffing needs or are there adequate staff members already in place? If a revised course, are there additional staffing needs? Instructor (from existing full-time ERE faculty); computer lab teaching space (existing spaces in Baker are adequate).

2.6 What Department (or extra-Department) resources are or will be made available to support the course or course revision? TA will be assigned should enrollment reach appropriate levels.

2.7 Anticipated Enrollment (enter where applicable)

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<th>Semester</th>
<th>Enrollment</th>
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<tr>
<td>Fall Semester</td>
<td>10-15</td>
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<td>Spring Semester</td>
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<td>Summer Semester</td>
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2.8 Anticipated frequency of class meetings. Twice weekly using standard 80 minute time blocks.
3. DETAILED COURSE DESCRIPTION

3.1 COURSE IDENTIFICATION AND FORMAT:

3.1.1 Course Prefix and Number: ERE533
3.1.2 Course Name: Ecological Modeling
3.1.3 Credit Hours: 3
3.1.4 Semester (check all that apply): Fall [x] Spring [ ] Summer [ ]
3.1.5 Format (check as appropriate): Lecture [x] Online [ ] Lab [ ] Field [ ] Other [ ] (explain)
3.1.6 Contact hours per week: 3
3.1.7 Prerequisite(s) – if none, please enter “None” (Be specific, as Upper Division courses and Graduate courses will likely have some pre-requisite knowledge) ERE335 or equivalent. Student should have been introduced to a programming language like R or Matlab before taking this course.

3.2 SCOPE:

3.2.1 Level of Instruction (check one, or two if a shared resource course):
   Lower Division [ ] Upper Division [ ]
   Beginning Graduate [x] Advanced Graduate [ ]

3.2.2 Relation to curriculum or to other ESF or Syracuse University courses:
   a. Is this a required course? No [x] Yes [ ]
      If Yes, please list the program(s) for which it is a requirement:
   b. Is this an elective course within your department? No [x] Yes [ ]
   c. Is enrollment in this course restricted? No [x] Yes [ ]
      If Yes, please explain:
   d. Are other ESF or SU courses similar or identical to this course? No [x] Yes [ ]
      If Yes, please identify the courses:
   e. Is this course a shared resource offering (i.e. is there a graduate or undergraduate concurrent offering)? No [x] Yes [ ]
      If Yes, what is the course number of the concurrent offering?

3.3 STUDENT LEARNING OUTCOMES:

Identify the student learning outcomes associated with this course.

At the completion of the course students will be able to:

- Define the role, advantages, and limitations of models in engineering today.

- Conceptualize and create models that simulate natural processes according to a first principles understanding of the process.

- Create simulations across space and time.

- Evaluate the suitability of models using a variety of metrics.
3.4 **MAJOR CONCEPTS, PROCESSES or TOOLS:**

Identify the course content and themes (e.g. Table of Contents) consistent with the learning domains and outcomes.

Week 1: Introduction to modeling  
Week 2: Basic differential equations  
Week 3: Taylor series  
Week 4-5: Implicit and explicit finite difference schemes  
Week 6: Root finding techniques  
Week 7: Basic linear algebra  
Week 8: 1-D space and time simulations  
Week 9: Boundary condition simulations  
Week 10: Interfacial transport  
Week 11: Model evaluation metrics  
Week 12: Sensitivity analyses  
Week 13-14: Parameterization  
Week 15: Term project presentations

3.5 **INSTRUCTIONAL METHODS:**

Identify the methods used to meet the course outcomes, as well as the principal instructional methods.

Delivery: Course will use a flipped classroom approach. Lectures will be recorded and available for viewing before class.  
In class time will focus on:  
1) Discussion of assigned model paper readings.  
2) Activities to help clarify concepts for students.  
3) Supplemental lectures to fill in blind spots  
4) Time to work on graded assignments and term project.

Evaluation:  
Assignments due approximately weekly. Assignments ask students to apply skills developed that week.  
Tests: Students demonstrate ability to use core skills and develop programs that can synthesize the skills into a functioning model and describe the ecological meaning the model suggests.  
Term project where students will select an environmental phenomena to model in order to demonstrate ability to synthesize understanding of ecological concepts and the use of model development practices. Intermediate deliverables throughout the semester will require students to accomplish incremental progress on the project. Model source code and a written report on the model will be due during final exam week. Students will present their models to the class in the final week of classes.

Textbook: No textbook is required for this class.

3.6 **CATALOG DESCRIPTION**

Provide the course description using the precise format to be included in the ESF catalog (i.e. course number and title; format; brief description; semester(s) offered; and pre-/co-requisites). Please do not exceed 1000 characters. ERE533 Ecological Modeling (3)
Three hours of lecture, discussion and experimentation per week. Development, use, and interpretation of mechanistic numerical models applied to ecological systems. Students will develop a model on a topic of their choice throughout the semester. Fall.
Prerequisites: ERE 335 or equivalent coding class

3.7 COURSE HISTORY:

Provide the dates of prior approval of this course, and its revision history.

3.7.1 Relationship to current ESF courses

This course is replacing a current ESF course ☐ YES ☒ NO

If NO, then proceed to section 4 below.

If YES, then provide below the number and name of the course to be deactivated and removed from the catalog once this course proposal has been approved:

Course Number (of the course to be replaced)
Course Name (of the course to be replaced)

If the course to be replaced is used by departments other than the department sponsoring this proposal, please indicate below which departments are affected and the date they were notified about the course replacement.

Department: Date of Notification:
Department: Date of Notification:
Department: Date of Notification:
Department: Date of Notification:
4. Institutional Impacts:

This section pertains to forecasting institutional resource needs to support the course or course revision. Provide clear statements regarding the needs and current availability (or absence) of resources. Note that, if this is a course revision, only the impacts of the revision should be included.

Staffing needs: Instructor, TA (available within ERE)

Classroom resources (e.g. physical facilities in a laboratory, lecture hall, flexible space, academic computing): Computer lab teaching space. Projector, internet access, white boards or document projector.

Technology Resources:

Computing Resources (software licensing, hardware, access): Matlab

Library Resources (subscriptions, services): None

Transportation Requirements (budget, fees, fleet vehicles): None

Forest Properties or Field Practicum Facilities: None
5. Health and Safety Considerations:

Will any of the conditions or situations outlined below be present in association with the course?

Yes / No

5.1. Will substances with any of the following properties be used during instruction: flammability, toxicity, corrosivity, reactivity, registered pesticide, legally controlled, or other characteristics with the potential to cause harm or injury?

☐ / ☒

5.2. Will any physical hazards be present during instruction? (e.g., machines that need safety guards; razor blades or syringes; compressed gases, etc.).

☐ / ☒

5.3. Will any biological hazards be present during instruction? (e.g., handling animals (rabies or hantavirus); cultures or stocks of infectious agents (fungal spores, viruses, bacteria, etc.).

☐ / ☒

5.4. Will any radiation hazards be present during instruction? (e.g., radioisotopes, X-rays, ultraviolet rays, lasers, etc.).

☐ / ☒

5.5. Will any electrical equipment that, due to its design, location, or method of use, pose any threat to safety during instruction? (Give considerable thought to electrical use outdoors, or any potentially wet location.).

☐ / ☒

5.6. Will there be any personal safety issues related to the class? (e.g., due to time of day or location, at the end of any organized class exercise, will students be in danger of physical assault, etc.).

☐ / ☒

5.7. Will any students be driving official state or research sponsored land or water vehicles during any class or instructional exercise?

☐ / ☒

5.8. Will any type of personal protective equipment be necessary during class exercises? (e.g., hard-hats, eye/face protection, hearing protection, hand/foot protection, lab coat, visibility clothing, etc.)

☐ / ☒

If the answer was “Yes” to any of the HEALTH AND SAFETY questions, please explain:

For lab and field courses to which all answers are “no”, you should explain that here, also. Normally, we would expect some safety precautions for such courses.
6. Coordination and Consultation

Emails/letters, as noted below and attached to this proposal, or signatures below, indicate that the affected departments, programs or units have been notified of this proposal and have had an opportunity to assess the impact of the proposal on their respective units.

Affected Academic Department(s) or Program(s) – other than the sponsoring department:

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<tr>
<th>Department/Program</th>
<th>Name of Chair/Program Director</th>
<th>Chair Signature</th>
<th>Date</th>
<th>Or letter attached</th>
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<td>Department/Program 2</td>
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<td>Department/Program 3</td>
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[if more than three Departments/Programs, please continue on a separate page]

Other Units:

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<th>Position</th>
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<th>Date</th>
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<tr>
<td>Associate Provost for Instruction &amp; Dean of the Graduate School (for Gen Ed courses only)</td>
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<td>Registrar</td>
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7. Proposer Information and Sponsoring Department Chair Affirmation:

Contact Person:
Name: Timothy Morin ________________________________
Department: ERE ____________________________
Email: thmorin@esf.edu ________________________________ Phone: 315-470-4709

This proposal has been reviewed and approved by the sponsoring Department. Affected departments have been notified and given the opportunity to provide feedback. Department resources are or will be made available to support the course, or a plan is in place to meet the resource needs as identified in the Institutional Impacts section of this proposal (see Section 4, above).

Name: Lindi Quackenbush __________________________________________________________________________ Date: 16 September 2020 ______
Department Chair (or designated curriculum representative)

Signature: ______________________________________________________________________________ Or letter attached ☐
Department Chair (or designated curriculum representative)

8. Approvals:

_________________________________________________________ __________________________
Curriculum Committee Date

_________________________________________________________ __________________________
Faculty Governance Date

_________________________________________________________ __________________________
Provost Date