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: 11/27/17

1. **Course Information:**

1.1 Course Prefix and Number: RMS 465

Course Title: Renewable Materials and Surfaces: Testing

(If a new or renumbered course, please check with the Registrar regarding the use or reuse of the course number)

1.2 ☒ This is a New Course.

OR

☐ This is a Major Course Revision

OR

☐ This is a Minor Course Revision

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)

☐ Course Number/Division ☐ Learning Outcomes ☐ Institutional Resources

☐ Title ☐ Concepts, Content ☐ Semester Offered

☐ Credit hours ☐ Catalog Description ☐ Course Inactivation

☐ Pre- or Co-requisite(s) ☐ Instructional Methods ☐ Course Reactivation

☐ Format ☐ General Education

1.3 General Education knowledge and skills area (if applicable): If none, check here ☒

☐ American History ☐ Humanities ☐ Other World Civilizations

☐ The Arts ☐ Mathematics ☐ Social Sciences

☐ Basic Communication ☐ Natural Sciences ☐ Western Civilization
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 is an advanced modular course on properties of renewable materials which will be required for all three options in the Renewable Materials Science program: Wood Science, Paper Science, and Polymer Science.

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.

RMS 200 or permission

2.3 Explain the impact of this course in meeting the goals and outcomes of other Departments/programs (if any). NA

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. NA

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? Current staff

2.6 What Department (or extra-Department) resources are or will be made available to support the course or course revision? None

2.7 Anticipated Enrollment (enter where applicable)

   Fall Semester: 25  Spring Semester:
   Summer Semester:

2.8 Anticipated frequency of class meetings. Two lectures and one lab per week
3. DETAILED COURSE DESCRIPTION

3.1 COURSE IDENTIFICATION AND FORMAT:

3.1.1 Course Prefix and Number: RMS 465
3.1.2 Course Name: Renewable Materials and Surfaces: Testing
3.1.3 Credit Hours: 3
3.1.4 Semester (check all that apply): Fall ☒ Spring ☐ Summer ☐
3.1.5 Format (check as appropriate): Lecture ☒ 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) RMS 200 or permission

3.2 SCOPE:

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

3.2.2 Relation to curriculum or to other ESF or Syracuse University courses:
   a. Is this a required course? No ☐ Yes ☒.
      If Yes, please list the program(s) for which it is a requirement: RMS
   b. Is this an elective course within your department? No ☒ Yes ☐.
   c. Is enrollment in this course restricted? No ☒ Yes ☐.
      If Yes, please explain:
   d. Are other ESF or SU courses similar or identical to this course? No ☒ 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 ☒ 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.
Upon completion of this course, each student will be able to demonstrate and apply knowledge of:
1. The optical characteristics of wood and paper
2. The physical/mechanical properties of wood, wood products, wood composites, paper, paper products, polymers, and polymeric composites
3. How wood, wood products, paper, and paper products perform under different mechanical and other stimuli
4. The various structural, physical, and optical properties of different paper grades, including printing and writing, packaging, and sanitary grades
5. The relationships between the properties of fibers, paper manufacturing methods, papermaking non-fibrous additives, and the ultimate properties of different paper grades, including printing/writing, packaging, and sanitary grades
6. Relationships between the chemical composition and physical / chemical properties of polymers and how sustainable materials can be “engineered” from both natural and synthetic
polymers, including “composites” that might involve both polymer types. 7. The physical and chemical properties of polymers as they impact utilization in “high tech” applications of sustainable polymers in optics, electronics, advanced energy storage materials (batteries), stimuli responsive materials, drug delivery, artificial tissues and other yet-to-be discovered applications

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.

1. Fundamental aspects of renewable materials and surfaces (4 weeks)
   1.1 Multiphase materials: Structure and morphology
      1.1.1 Scaling: Microscopic, mesoscopic, macroscopic--upscaling and downscaling, relations between microstructure and larger scale properties
      1.1.2 Description of materials' structures--porosity, specific surface, correlations
      1.1.3 Anisotropy--definition, mathematics
      1.1.4 Heterogeneity--definition, application
      1.1.5 Modern morphological analysis--elements of mathematical morphology
         a) Networks--ordered and random
         b) Percolation--connectedness
      1.1.6 Equilibrium and dynamics
   1.2 Mechanical properties
      1.2.1 Storage and loss moduli
      1.2.2 Elastic moduli, anisotropy
      1.2.3 Plasticity
      1.2.4 Stiffness
   1.3 Thermal and moisture properties (interaction with environment)
      1.3.1 Heat capacity, latent heat (phase transitions)
      1.3.2 Equilibrium and dynamics: hysteresis
      1.3.3 Sorption and moisture interactions
      1.3.4 Diffusivity and thermal conductivity
      1.3.5 Dimensional instability, influence on other properties (elastic moduli, etc.)

2. Applications
   2.1 Wood products and wood composites (3 weeks)
      2.1.1 Wood structure
         2.1.1.1 The wood cell wall
         2.1.1.2 Anatomical characteristics
         2.1.1.3 Wood surface structure as produced by various processes
      2.1.2 Properties of wood products and wood composites
         2.1.2.1 Physical
            2.1.2.1.1 Moisture relations
            2.1.2.1.2 Specific gravity/density
            2.1.2.1.3 Other properties
         2.1.2.2 Mechanical
            2.1.2.2.1 Introduction to important mechanical properties (tests)
            2.1.2.2.2 Stiffness
            2.1.2.2.3 Strength
            2.1.2.2.4 The effect of moisture
            2.1.2.2.5 The effect of temperature
            2.1.2.2.6 The effect of time
      2.2 Pulp/Paper/Packaging products (3 weeks)
         2.2.1 Structural properties--grammage, thickness, formation, porosity, smoothness
         2.2.2 Mechanical properties--zero-span tensile strength, tear, bulk, folding endurance, compression strength
         2.2.3 Optical properties
2.2.3.1 Principles of light interaction with materials and surfaces--absorbance, scattering and transmission: Beer Lambert law, Kubilka Munk theory
2.2.3.2 Principles of color and gloss: hue/saturation/lightness
2.2.3.3 Printing
2.2.4 Interaction with the environment
2.2.4.1 The effect of moisture
2.2.4.2 Barrier resistance
2.3 Polymers (3 weeks)
2.3.1 High performance "engineering polymers" with extraordinary thermal, mechanical, and optical properties
2.3.2 Polymer rheology and processing techniques (extrusion, molding, casting) and their impact on the physical/mechanical properties of solid polymers
2.3.3 Crystal structure and multi-domain morphology of polymers in films, fibers and solid materials. Induced axial orientation of polymer molecules for high strength.
2.3.4 Polymer membranes and diffusion/transport properties in polymers
2.3.5 Interfacial properties of polymers as matrices for "fillers" in composite materials
2.3.6 Electrical properties of polymers

3.5 INSTRUCTIONAL METHODS:

Identify the methods used to meet the course outcomes, as well as the principal instructional methods. Lectures, discussions, and laboratory exercises

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.

RMS 465 Renewable Materials and Surfaces: Testing (3)
Study bulk and surface properties of porous materials, including structure, morphology, mechanical, optical, thermal and moisture equilibrium and dynamics. Applications to wood products and wood composites, pulp/paper/packaging products; natural and synthetic polymers. Fall

3.7 COURSE HISTORY:

Provide the dates of prior approval of this course, and its revision history. New course 2018

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.

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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: Current staff, GA

Classroom resources (e.g. physical facilities in a laboratory, lecture hall, flexible space, academic computing):
Lecture room, Baker ASTM/TAPPI laboratory, conditioning rooms, testing laboratory

Technology Resources:
Whiteboard, projection camera, projector

Computing Resources (software licensing, hardware, access):
Current resources

Library Resources (subscriptions, services):
Current resources

Transportation Requirements (budget, fees, fleet vehicles):
NA

Forest Properties or Field Practicum Facilities:
NA
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:
5.8--Observing/using testing equipment in Wood Engineering Laboratory will be supervised. Eye protection will be provided.

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 1</th>
<th>Name of Chair/Program Director</th>
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[if more than three Departments/Programs, please continue on a separate page]

Other Units:

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<th>Associate Provost for Instruction &amp; Dean of the Graduate School (for Gen Ed courses only)</th>
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| Environmental Health and Safety     | Date | Or letter attached | Date |
7. Proposer Information and Sponsoring Department Chair
Affirmation:

Contact Person:

Name: R.W. Meyer ____________________________
Department: PBE ____________________________
Email: rwmeyer@esf.edu ____________________________
Phone: X6838 ____________________________

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: ____________________________ Date: ______
Department Chair (or designated curriculum representative)
Signature: ____________________________ Or letter attached □
Department Chair (or designated curriculum representative)

8. Approvals:

________________________________________________________________________ Date
Curriculum Committee

________________________________________________________________________ Date
Faculty Governance

________________________________________________________________________ Date
Provost