Date: March 29, 2013

Course Number: 
Course Title: Medical and Industrial Applications of Electron Microscopy

☐ New Course OR ☒ Changes in existing course (check all that apply):

☐ Prefix
☐ Number
☐ Credits
☐ Title
☐ Description
☐ Pre-requisite(s)
☐ Co-requisite(s)
☐ Shared Resources
☐ Course Format
☐ Content
☐ Semester Offered

This course meets the General Education standards in the following knowledge and skills area (check all that apply):

☐ American History
☐ The Arts
☐ Basic Communication
☐ Humanities
☐ Mathematics
☐ Natural Sciences
☐ Other World Civilizations
☐ Social Sciences
☐ Western Civilization

Prequisites or co-requisite requirements:

☒ Prerequisites: None ☐ Co-requisites:

Institutional Impact:

Anticipated Enrollment: 8 per semester

Technology and Classroom Resource Demands: transmission and scanning electron microscope for demonstrations by instructor; TEM and SEM preparation lab for demonstrations (no hands on work)

Computing Resources: none

Library Resources: none outside the normal literature resources

Transportation Requirements: field trips to industrial sites/laboratories

Forest Properties or Field Practicum Facilities Required: none
Health and Safety Considerations:

Conditions or situations present in association with the course? Yes / No

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? Yes

2. **Will any physical hazards be present during instruction?** (e.g., machines that need safety guards; razor blades or syringes; compressed gases, etc.) No

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.). No

4. **Will any radiation hazards be present during instruction?** (e.g., radioisotopes, X-rays, ultraviolet rays, lasers, etc.) No

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.) No

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.) No

7. **Will any students be driving official state or research sponsored land or water vehicles during any class or instructional exercise?** No

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.) No

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

During lab demonstrations, toxic or reactive substances may be used by the instructor. The students will not handle any chemicals.

**CATALOG DESCRIPTION** (Please provide using the precise format currently used in the ESF catalog, please do not exceed 500 characters):
DETAILED COURSE DESCRIPTION

COURSE: MCR 570 – Medical and Industrial Applications of Electron Microscopy
3 Credit Hours – Spring Semester
3 Hours Lecture/demonstration per week
Prerequisite(s): None CME 480 Fundamentals of Microscopy

SCOPE:

1. Level of Instruction:
   a. MCR 570 is for advance undergraduates or graduate students to learn medical and industrial applications of scanning and transmission electron microscopes.

2. Relation to curriculum or to other ESF or Syracuse University courses:
   a. MCR 570 is a graduate level elective course offered by faculty in the N.C. Brown Center for Ultrastructure Studies in the Department of Sustainable Construction Management and Engineering. This course is open to undergraduate students and graduate students in all disciplines at ESF, SU, and Upstate Medical University if space allows, especially students in pre-med, biology, biotechnology, wood science, nanoparticle science, materials science, paper science, chemistry, pathology or other structure related disciplines.
   b. Shared resource requirements: None

STUDENT LEARNING OUTCOMES:

After completing this course the student should be able to:

1. Explain the instrumentation and underlying principles of industrial applications of scanning and transmission electron microscopy
2. Describe the wide variety of industrial applications that use TEM and SEM, such as clinical, manufacturing, automotive, semiconductor, pharmaceutical, chemical, mineral, petroleum, polymer, solar, forensic, glass, building material and pulp and paper industry
3. Interpret micrographs and publications dealing with industrial applications, especially structure – function relationships on the ultrastructural level
4. Explore the latest techniques and advances in instrumentation
5. Explain correlative microscopy techniques and how other methods (such as focused ion beam, atomic force, light, confocal, Raman, electron probe microanalysis, x-ray and spectrometry) can be used in combination with electron microscopy

MAJOR CONCEPTS OR METHODOLOGIES:

This course details the instrumentation and underlying principles for utilization of scanning and transmission electron microscopy in the medical and industrial fields (such as manufacturing, automotive, semiconductor, pharmaceutical, chemical, mineral, petroleum, polymer, solar, forensic, glass and pulp and paper industry), discussing safety, calibration, quality control and trouble-shooting techniques, as well as methods in sample preparation and image collection, interpretation and analysis. Structure-functions relationships on the ultrastructural level will be discussed in biological science applications within the industrial and clinical settings. Combinations of equipment in association with the electron microscope such as focused ion beam, atomic force, light, confocal, Raman, electron probe microanalysis, x-ray and spectrometry will be evaluated for use in appropriate settings. The course will explore the latest procedures and publications to analyze small morphological features of nanoparticles, and pathogens, determine the relationship among performance, microstructure, and processing conditions, evaluate packaging materials and product components, monitor production processes and perform effective wear and failure analysis.

CATALOG DESCRIPTION (Please provide using the precise format to be included in the ESF catalog, please do not exceed 50 words)
MCR 570 Medical and Industrial Applications of Electron Microscopy (3)

Three hours of lecture/demonstration per week. Scanning and transmission electron microscopy applications in the medical, petroleum, polymer, solar, forensic, glass, pulp and paper and other industries. Lecture and demonstration of methods used to prepare samples, collect images, and interpret results. Safety, calibration, and quality control techniques. Spring. Prerequisite(s): None Undergraduates only CME 480 Fundamentals of Microscopy

COURSE HISTORY:

Last approved: This course was approved as a new course, May 2012 NA. With departmental approval it is submitted March 22, 2013 to remove the prerequisite.

Revised Draft: January 26, 2012(form in protected format: 3/29/13)