635:402
Senior Ceramic Lab II
Department of Ceramic and Materials Engineering

Course Instructor:
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Term:
Spring Semester, 2005

Office Hours:
By Appointment

Description:
Senior Ceramic Lab II is the second of two Senior Ceramic Laboratory classes (where the first is Lab I in the Fall Semester). In this course, students choose an independent research project and carry out the project under the direct supervision of a Faculty member. The Faculty member is the one directly interacting with and responsible for the technical oversight of the student’s research program, progress, lab notebook, etc. I, as the instructor, meet with all of the students in this class once every week to discuss the progress and problems in conduct of the research. I introduce the students to the challenges and problems of doing independent research, as well as discuss with them research philosophy and methodology. I require them to acquire broad fundamental knowledge and background relevant to their research topic and give a 40-minute lecture on the basics of their research area. This is in addition to the specific experimental techniques they learn in the lab, so that they may be better able to have an overall picture of their research project and where it fits in their field. I discuss with them the general similarities and differences between academic research and industrial R&D, and the basics of patent applications. I discuss with them the importance of communication skills and help them with written and oral presentation skills.

Objective:
The objective of Senior Lab II is to give students the important experience of conducting an independent research project with a Faculty advisor. The class is intended to help the students to develop the ability for independent research and independent scientific thinking and judgment. In addition, this class is intended to help the students improve their ability to communicate their research plans, progress and results in writing and in oral presentations with visual computer graphics.
Prerequisites:
Students must be in good academic standing and have satisfactorily completed the course work appropriate at the junior level.

Attendance:
Attendance is mandatory! Attendance is taken at each class meeting. Only if the students indicate that they have an acceptable reason for an absence, before the class, will they be excused. Students will be excused from class without penalty because of a religious observance.

Projects:
Each student will be required to carry out an independent lab-based research project under the direct supervision of a Faculty member (or members). In addition, the students will be required to give a 40-minute lecture on the basics of the research area relevant to their project, make a mid-term presentation (5–7 minute) on the progress of their research and a 15-minute final presentation and submit a final report (15 pages) that summarizes the entire semester project. Students will also be required to keep a lab notebook and submit that for grading.

The students are asked to give me opinions, input, questions, ideas as to the current conduct of the course and ways to improve the course any time during the semester.

Grading:
The final grade for the course will be compiled as follows:

- Lecture on basics: 10%
- Final laboratory notebook: 10%
- Final report: 10%
- Final presentation: 10%
- Final outcome of research project: 60%

Policy on Calculators:
As there are no exams in this class, there is no policy on calculators.

Policy on Other Electronic Devices:
The use of cell telephones, pagers, Walkman or any other electronic device that may disrupt the class is not permitted. Students are encouraged not to bring these devices to class. If it is necessary to bring a device to class, it must be turned off or muted. It is acceptable for students to bring a computer to class if they choose to take notes in this manner (provided it does not disturb anyone in the class) or to make LCD presentations.

Academic Integrity:
Students will be expected to adhere to the Policy on Academic Integrity listed within the New Brunswick Undergraduate Catalogue. Students are encouraged to review this policy.
**Contribution of Course to Meeting the Professional Component of ABET:**
Senior Laboratory is the capstone course for students who primarily are interested in continuing their education in graduate school. The course integrates the fundamental science, e.g. physics, chemistry and mathematics with the engineering courses the students completed in earlier semesters. By carrying out an independent research program with the Faculty advisor and the course instructor, the student learns how research into new ceramic materials, processes, components, and systems is carried out. This also puts their prior education into perspective with respect to the engineering profession.

Senior Laboratory II is the students’ second course in a sequence of two courses. The course gives the students the final experience of the conduct of independent laboratory-based research. This course provides the student with an understanding of the challenges and pleasures of independent laboratory-based research. Many students use this course as a yardstick upon which (in part) they will make their decisions about going to graduate school or not.

**Relationship of Course to Program Objectives:**
Senior Laboratory II develops an integrated opportunity for students to use all of their prior course work to carry out independent research on a ceramic engineering problem. In all cases, the students use their understanding and practice their knowledge on the structure, processing and properties of materials used in ceramic applications. Students will see how new ceramic materials or processes are developed which allow one to optimize some aspect of ceramic materials. In this manner, they are conducting research that is directly relevant to current ceramic science and engineering. This research opportunity prepares them very well to enter the Ceramic Engineering or other discipline or to continue on to Graduate School in Ceramics, Materials or other materials related field.

This course improves their ability to apply knowledge of mathematics, science and engineering. This course improves their ability to design and conduct experiments, as well as to analyze and interpret data. This course improves their ability to design a system, component, or process to meet desired needs. This course improves their ability to function on a team. This course improves their ability to identify, formulate and solve engineering problems. This course improves their ability to understand professional and ethical responsibility. This course improves their ability to communicate effectively. This course improves their ability to understand the impact of engineering solutions in a global and societal context. This course improves their knowledge of contemporary issues related to ceramic engineering. This course improves their ability to use experimental, statistical, and computational methods to analyze the behavior of ceramic systems. This course improves their understanding of the fundamental principles underlying and connecting structure, properties, processing and performance related to the material systems utilized in ceramic engineering.
Student Input and Instructor Response to Teaching Excellence Surveys in the Prior Semester

Comment: For the course taught in Spring 2004, one student commented that what they did was not really independent research. It was close but because of students’ lack of background it was difficult to do really independent research.

Response: More emphasis will be put on making sure that the students are well versed in the fundamentals and familiar with the research literature relevant to their research projects. They will be required to do extensive reading of relevant research literature and give a 40-minute presentation on the fundamentals and background of their research project.

Comment: For the course taught in Spring 2004, one student commented that research advisors need to understand that the student is supposed to do independent research, not a lab technician for graduate students.

Response: Students will be encouraged to talk to the Instructor as well as the Research Supervisor early on during the semester if the student feels that he or she is functioning like a lab technician rather than doing independent research. The Instructor will discuss with the Research Supervisor how to improve the situation. It is often helpful to have the student work with graduate students or postdocs in the lab as they are more experienced and knowledgeable and capable of offering technical assistance. However, the student must have a high degree of intellectual independence in the conduct of the project.