DEPARTMENT OF CHEMICAL ENGINEERING

Syllabus

CHE 59806: Nanomaterials Laboratory

Designation: elective course

Catalogue Description: Quantitative Laboratory studies and measurements including (i) the synthesis of nanoparticles, (ii) the measurement of absorption, emission, and fluorescence of nanoparticles, (iii) the imaging of nanoparticles with atomic force microscopy, (iv) the stress testing of nanocomposites, and (v) the evaluation of ethical concerns for the performance of experiments with nanomaterials.

Pre-requisite: Nanomaterials Course (ChE 59808)

Text: Material provided through instructor, scientific articles and laboratory manuals

Course Objectives:

After completing this course, students should

1) Be able to synthesize nanoparticles using chemical synthetic routes;
2) Be able to operate UV/vis spectrometer to follow the synthesis of nanoparticles;
3) Be to set up and operate equipment used for the measurement of absorption/ emission and fluorescence of nanoparticles;
4) Be able to analyze and interpret absorption/emission and fluorescence data;
5) Be able to operate an atomic force microscope;
6) Be able to prepare samples for atomic force microscopy;
7) Be able to operate a mechanical strain tester;
8) Be able to analyze and interpret stress-strain data;
9) Be familiar with ethical, environmental and health related issues associated with nanomaterials and their application.

Topics Covered:

1) Module 1: Synthesis of Nanoparticles
2) Module 2: Optical Characterization of Nanoparticles
3) Module 3: Imaging of Nanomaterials
4) Module 4: Mechanical Properties of Nanoparticle/PDMS Composites
5) Module 5: Ethical Consideration for Nanomaterials Research

Laboratory Schedule: This class meets once a week for a total of three academic hours over a fourteen-week semester. Each team of two/three students will complete 5 modules and will turn in a report for each of them. The reports are graded on the basis of English language used as well as technical competence.

Grading: five laboratory reports – 90% total, laboratory participation/handling – 10%.

Contribution of course to meeting the professional component:

This is an elective subject for Biomedical, Chemical, Electrical, and Mechanical Engineering as well as Chemistry and Physics. The primary purpose of the laboratory course is to provide the student with the ability to synthesize nanoparticles, measure their

optical properties, image them with atomic force microscopy, and measure their effect on the mechanical properties of a polymer.

Relationship of course to program outcomes:
The outcomes for this course contribute to the following departmental educational outcomes:

a. An ability to apply knowledge of mathematics, science and engineering;
b. An ability to design and conduct experiments, as well as to analyze and interpret data;
d. An ability to function on multi-disciplinary teams;
f. An understanding of professional and ethical responsibility;
g. An ability to communicate effectively;
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Instructor (person who prepared this description) and date of preparation.
Ilona Kretzschmar, kretzschmar@ccny.cuny.edu, 212-650-6769, January 22, 2009