

BME 5875: Frontiers in Biomedical Research for Teachers

Course Directors:

Prof. Chris B. Schaffer
cs385@cornell.edu

Office: B57 Weill Hall
Tel: 607 255 6277

Dr. Shivaun Archer
sda4@cornell.edu

Office: 141 Weill Hall
Tel: 607 255 3781

Course description:

The goal of BME 5875 is to help middle and high school science teachers increase their knowledge in key topics of relevance for biomedical science and for them to gain a sense of how new scientific knowledge is generated. This new knowledge and understanding of science topics and the process of science will then enable these teachers to provide better classroom instruction to their students.

Classroom work:

Readings, lectures, and discussions will provide science knowledge in a variety of topics over the six-week summer program. The topics covered in BME 5875 will focus on issues related to human health, allowing teachers to bring a real-world relevance to their classroom discussions and to show students how the science they are learning connects to the treatment of disease. Topics will also be interdisciplinary, providing a link between the traditional courses in physics, chemistry, and biology that are taught in middle and high school. The level will be high enough to provide a solid understanding of the relevant science concepts, but will also aim to link to ideas taught in middle and high school science classes. Possible examples include: chemical release kinetics for design of drug delivery devices; optical principles for monitoring of tissue oxygenation; high resolution microscopy to image cancer cells; and mechanical properties of gels for the engineering of replacement tissues. There will be weekly web-based quizzes related to the classroom portion of the course.

Research project:

One of the main goals of this course is to help teachers gain a first-hand appreciation of how new science knowledge is generated in the lab. Teachers will work with their partnered graduate fellow partner and a BME faculty member on a research project and report on their results to each other and to BME faculty and students. By actively participating in scientific research, teachers will learn more about the ways new scientific ideas are created as well as gain additional expertise in a particular area of biomedical science. This experience will give the teachers a “story” they can take back to their classroom to help students understand what scientists do and how new scientific ideas arise. The research topic will vary depending on the lab, but will generally be focused on basic science and engineering that is related to human health problems. The work on this research project will be the bulk of the teacher’s activities in this course. There will be two assignments related to the project. In the second week, teachers are asked to give a short talk (about 5 minutes) that outlines the motivation, specific goals, approach, and potential impact of their research project. In the final week, the teachers will present a poster on their research project to their fellow students, as well as BME faculty and graduate students.

Schedule:

Lecture: Fridays, 10:00 to 11:00 AM, in 224 Weill Hall. Six lectures from July 10 to August 14.

Discussion: An after-class informal discussion and question/answer session with the day’s lecturer will be held at the second floor balcony in Weill Hall. Light refreshments will be served.

Project presentations:

1. A 5-minute talk on the proposed project on July 15 at 10:30 am in 224 Weill Hall.
2. Final project results will be presented in a poster on August 14 at 1:30 pm in Weill Hall.

Course website:

Please check the BME 5875 website frequently. Course announcements, reading materials, reading and lecture quizzes, information about the course project, and extra materials will all be distributed via the website. Please enroll in the BME 5875 site at <http://blackboard.cornell.edu>. Navigate to “All Blackboard Courses,” select “Engineering” in the course catalog, then “Biomedical Engineering.” You will see BME 5875 in the list. Click on “Enroll.” **To sign up for the course, you will need to enter the access code: 987654.**

Reading and lecture quizzes:

Online quizzes on the reading assignments and lectures will be due each week. These quizzes will typically be posted after lecture each Friday and will be due by 5:00 pm the following Wednesday. There will be six quizzes over the course of the term. The assigned reading will be posted at least a week before the quiz is due and will be relevant for the upcoming lecture. The quiz will focus on this reading and on issues discussed in the previous lecture. The quizzes will consist of a few multiple choice questions followed by four essay questions. The first two essay questions as well as the multiple choice questions will be related to the material in the assigned reading and the previous lecture. The third and fourth essay questions ask students to describe concepts in the reading material and lecture, respectively, that they found confusing (or interesting, if nothing was confusing). The multiple choice and first two essay questions will be graded for accuracy. For the final two essay questions it must be clear from the response that the students have read the assigned reading and have thought carefully about the material covered in the reading and lectures in order to receive full credit.

Grading:

Reading and lecture quizzes (taken weekly on the course website): 40%

Project proposal talk (given in second week): 10%

Final poster presentation of project results (given in last week): 50%

Academic integrity:

Academic integrity is expected of all students of Cornell University at all times, whether in the presence or absence of members of the faculty. Violations of the code of academic integrity will be prosecuted through the Academic Integrity Hearing Board. For more information, see the following page on academic integrity: <http://cuinfo.cornell.edu/Academic/AIC.html>.

Lecture schedule:

Date	Lecturer	Topic
10 July	Larry Bonassar	Tissue Engineering
17 July	Chris Schaffer	Optical Imaging
24 July	Brian Kirby	Nanofluidics
31 July	Cynthia Reinhart-King	Atherosclerosis
7 August	Lynden Archer	Polymers
14 August	Jonathan Butcher	Heart Valves

Course mechanics:

Offered in summer, through Cornell University School of Continuing Education.

Three credits, open only to teachers participating in the BME GK-12 program. Letter grades.

Course components (96 hours total):

Science lectures: 7.5 hours (6 lectures, 75 minutes each)

Discussion sections: 6 hours (6 discussions, 60 minutes each)

Project time: 80 hours (background reading, research work in mentor’s lab, analyzing and preparing results for presentation)

Project presentation: 2.5 hours (1 hour for proposal talks, 1.5 hour for poster session)