Syllabus for BIOL 4590: Research Project Laboratory
Engineering Microbes for Biofuel Production and Bioremediation

Professor Information

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Class Schedule: Tu, Th 12:05 pm - 2:55 pm

Course Objectives

The objective of this course is to expose students to state-of-the art technologies for engineering microbes for biofuel production and bioremediation. Students will be working on projects in research areas currently funded by the National Science Foundation (NSF), the Department of Defense (DOD), and the National Aeronautic and Space Administration (NASA). Laboratory experiments will focus on interactions between microorganisms and the geosphere and bridge the gap between industry and environmental microbiology. Fundamental processes such as microbial physiology and genetics, genetic engineering, microbial diversity, biogeochemical cycles, and evolution will be examined. The students will also be exposed to the art of research presentations in the form of posters and scientific publications.

Course Material

The following textbooks may be useful references:

M.T. Madigan; J.M. Martinko; J. Parker. 2015. Brock Biology of Microorganisms. 14th edition, Prentice Hall, *On reserve in library*.

T. Fenchel; G. M. King; T. H. Blackburn. 2000. Bacterial Biogeochemistry: the ecophysiology of mineral cycling. Academic Press.

E. A. Paul; F. E. Clark. 2000. Soil Microbiology and Biochemistry. Academic Press.

F. J. Stevenson; M. A. Cole. 1999. Cycles of Soils: Carbon, Nitrogen, Phosphorus, Sulfur, Micronutrients, 2nd Edition. Wiley.

W. Stumm; J. J. Morgan. 1996. Aquatic Chemistry. Chemical equilibria and rates in natural waters. Wiley.

J. F. Banfield, J. Cervini-Silva, and K. M. Nealson, 2005. Molecular Geomicrobiology. Reviews in Mineralogy Vol. 59. Mineralogical Society of America.

Important Term Dates

1. First day of class: 12 January 2016
2. School holiday: 18 January 2016
3. Class withdrawal deadline: 16 March 2016
4. Spring break: 21-25 March 2016
5. Last day of class: 27 April 2016

Laboratory Topics

1. Evolution of Microbial Respiratory Systems
2. Microbiome of Iodate Bioremediation
3. Microbiome of Iron Bioremediation
4. Engineering Microbes for Biofuel Production
5. Marine Invertebrate and Bacterial Symbiosis

Organization of the Course

Students will participate in the laboratory activities associated with chosen topic (**6 hours per week, work hours sheet in DiChristina lab to be filled out after each work session**). A document in the form of an Introduction and Materials and Methods to a scientific paper (in the style of the journal *Applied and Environmental Microbiology*) is due on **25 February 2016** at 5:00 pm. A poster presentation of research results (including Introduction, Materials and Methods, Results, Discussion, and Conclusion) is to be presented on **21 April 2016** at the School of Biology undergraduate research celebration. A scientific paper is required from each student in the class. This paper should be written in the style of the journal *Applied and Environmental Microbiology*. The paper should be 10 pages in length (Font: Times 12; Lines: double-spaced, not including figures and references). The term paper is due **5 May 2016 at 5:00 pm** (one letter grade decrease per day of tardiness). The Georgia Tech code of honor is to be followed in all course requirements.

Grading

1. Introduction and Materials and Methods (due 25 February 2016 at 5:00 pm): 20%
2. Poster presentation (21 April 2016): 20%
3. Scientific paper (due 5 May 2016 at 5:00 pm): 40%
4. Lab participation (6 hours per week): 20%