CBEMS116 FIELD PRACTICUM IN ENVIRONMENTAL ENGINEERING

Catalog Data:	**CBEMS116 Field Practicum in Environmental Engineering (Credit Units: 4).** Introduction to the application of engineering and biological principles toward the remediation of hazardous wastes. Emphasis on genetically-engineered bacteria and biological reactors for degrading recalcitrant compounds. Prerequisite: CBEMS110. (Design units: 0)
Textbook:	Madigan, M. T., Martinko, J. M., and Parker, J., *Brock Biology of Microorganisms,* 10th edition, Prentice Hall, 2002. Townsend, John, *Practical Statistics for Environmental and Biological Scientists,* John Wiley & Sons, 2002.
References:	*Monitoring Bathing Waters: A Practical guide to the Design and Implementation of Assessments and Monitoring Programmes,* Bartram, J. and Rees, G. (Eds.), E&FN Spon, London, U.K., 2000. Srivastava, Muni S., *Methods of Multivariate Statistics,* John Wiley & Sons, 2002. Horan, N. J., *Biological Waste water Treatment Systems: Theory and Operation,* John Wiley & Sons.
Coordinator:	Stanley B. Grant
Course Objectives:	The student is expected to actively participate to in-class discussions and provide feedback on the methods adopted in the course. The goals of this course are to provide the students with: (i) a rigorous introduction to the biochemistry, genetics, and biology of microorganisms, emphasizing applications to engineered and natural systems, (ii) hands-on laboratory skills for the microbiological analysis of water and wastewater, (iii) basic statistics in environmental engineering, and (iv) a field-based learning experience that brings together the conceptual and laboratory components of the course.
Course Outcomes:	Students will be able to: Explain how biochemistry, genetics, and biology of microorganisms contribute to applications in engineered and natural systems. Conduct both physical and microbiological analyses of water. Propose and perform a field study to investigate water quality in natural systems. Analyze and present the results of a field study, and Recommend strategies to improve water quality based on the field study.
Prerequisites By Topic:	Understanding of General Chemistry, Basic Physics, Basic Calculus, Organic Chemistry and/or Environmental Chemistry
Lecture Topics:	Overview of Class Structure, Design Project Logistics, Introduction to U.S. Environmental Regulations. Public Health Microbiology, and the Design of Field Surveys. Cell Biology, Energetics of Microbial Growth, Molecular Genetics, Viruses, and Molecular Diagnostics. Statistics basics (Designing an experiment or survey, exploratory data

analysis and data presentation), Statistical methods (multivariate statistics)

Class Schedule: Each class meets 4 hours per week for 10 weeks.

Computer Usage: Multivariate statistics is used to analyze and interpret complicated data sets generated during the field study. This includes the use of statistical packages such as SPSS, SAS and MINITAB to address the research questions and hypotheses.

Laboratory Projects:

Professional Component: Contributes toward the Chemical Engineering Topics Courses and Major Design experience.

Relationship to Program Outcomes: This course relates to Program Outcomes 5, 8, 9, 10, 11, and 12 as stated at: http://www.eng.uci.edu/dept/objective_chemical

Design Content Description

Approach: To provide an open-ended project in which the students (i) design and implement a field-based study of a local wetland, (ii) defend their results orally, and (iii) generate a written summary of their work--called *The 2002 UCI Water Quality Survey*--suitable for public dissemination. Teams of 4-5 students are responsible for different aspects of the project, including site selection, sampling protocol development, permit applications, laboratory analysis of water samples, and report generation. The role of the advisory panel is to assist the students in defining and carrying out their project, and to provide feedback on student results prior to report generation. Orange County Agencies represented on the panel include the Sanitation District, Flood Control District, and Public Health Department. Students are encouraged to contact the panel members to discuss the project throughout the course. To facilitate student/panel interactions, several members of the panel are scheduled to present guest lectures in class.

Lectures: 100%

Laboratory Portion: 0%

Grading Criteria:

Homework:	15%
Quizzes:	10%
Class participation:	5%
Lab exercises:	20%
Design project (first draft, second draft, presentation):	50%
	100%

Exams and quizzes are closed book and notes. In general, exams and quizzes cannot be made up and no late homework sets will be accepted.

Estimated ABET Category Content:

Mathematics and Basic Science: 0 credit units or 0%
Engineering Science: 2 credit units or 50%
Engineering Design: 2 credit units or 50%

Prepared by: Stanley B. Grant **Date:** July 2005

CEP Approved: Fall 2001