Continuous Improvement Worksheet for Civil, Environmental Geomatics Engineering Courses

Semester	Fall	**Year**	2012
Course Number	ENV3001	**Prerequisites**	Strength of Materials EGM3524 and Engineering Chemistry EGN2095 with lab EGN2095L (or equivalent)
Course Name	Environmental Science and Engineering	**Course Description**	Physical, chemical and microbiological components of environmental systems in science and engineering. Introduction to water quality management, air pollution control, solid waste management, pollution prevention techniques, and risk analysis. Laboratory and field trips are included.
Credits	3	**Delivery Method**	Standard Grade Mode

Course Objectives	
A.	Present the fundamental concepts of chemistry, biology, ecology, and physics applied in environmental engineering
B.	Present the fundamental principles of mass and energy balance of natural and manmade environmental systems
C.	Relate theory to real life problems in the analysis of systems to improve environmental quality, including Streeter-Phelps and Gaussian plume modeling
D.	Expose students to the complex interaction between environmental problems and the needs of society
E.	

Course Objectives Related to Program Objectives		**Program Objectives**
Preparation for Practice:	Graduates will be prepared for entry-level positions in their discipline and for graduate/professional studies	A,B,C,D
Tools for Creativity:	Graduates will experience the creative and design processes and their application to typical engineering situations	C,D
Societal Awareness:	Graduates will receive the breadth of education necessary to integrate practice in their disciplines with the needs and interests of a diverse	A,D
Leadership Skills:	Graduates will be prepared for leadership in their discipline	D

Course Outcomes	
1.	Ability to understand the chemistry, biological, ecological, and physical concepts necessary to analyze basic environmental engineering problems. (a, b, c, e, f, h, k)
2.	Ability to understand the processes of pollutant transport and ability to apply mass balance to determine pollutant concentrations in space and time (a, b, e, f, h, k)
3.	Ability to understand the important local, regional, and global problems as they relate to air pollution, solid waste management, and water quality (b, e, f, h, j)
4.	Ability to understand the process of environmental management, including pertinent laws and regulations (e, f, h, j, k)
5.	Ability to communicate effectively about issues in environmental engineering (d, e, f, g, i)

Course Outcomes Related to Program Outcomes		**Course Outcomes**
a.	An ability to apply knowledge of mathematics, science, and engineering	1,2
b.	An ability to design and conduct experiments, as well as to analyze and interpret data	1,2,3
c.	An ability to design a system, component, or process to meet desired needs	1
d.	An ability to function on multi-disciplinary teams	5
e.	An ability to identify, formulate, and solve engineering problems	1,2,3,4,5
f.	An understanding of professional and ethical responsibility	1,2,3,4,5
g.	An ability to communicate effectively	5
h.	The broad education necessary to understand the impact of engineering solutions in a global and societal context	1,2,3,4,5
i.	A recognition of the need for, and an ability to engage in life-long learning	5
j.	A knowledge of contemporary issues	3,4
k.	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	1,2,4

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Strategies to Achieve Course Outcomes				
Course Outcomes		**Strategies**		**Supporting Course Objectives**
1.	Ability to understand the chemistry, biological, ecological, and physical concepts necessary to analyze basic environmental engineering problems. (a, b, c, e, f, h, k)	**1.**	Lecture presentation of topics	A,B
		2.	Homework, midterm and final exams	
		3.	Laboratory experiments	
2.	Ability to understand the processes of pollutant transport and ability to apply mass balance to determine pollutant concentrations in space and time (a, b, e, f, h, k)	**1.**	Lecture presentation of topics	A,B,C
		2.	Homework, midterm and final exams	
		3.	Laboratory experiments	
3.	Ability to understand the important local, regional, and global problems as they relate to air pollution, solid waste management, and water quality (b, e, f, h, j)	**1.**	Lecture presentation of topics	C,D
		2.	Homework, midterm and final exams	
		3.	Laboratory experiments	
4.	Ability to understand the process of environmental management, including pertinent laws and regulations (e, f, h, j, k)	**1.**	Lecture presentation of topics	C,D
		2.	Homework, midterm and final exams	
		3.	Laboratory experiments	
5.	Ability to communicate effectively about issues in environmental engineering (d, e, f, g, i)	**1.**	Lecture presentation of topics	A,B,C,D
		2.	Homework, midterm and final exams	
		3.	Laboratory experiments	

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Assessment of Course Outcomes Course Outcomes		Assessment Techniques		Level of Achievement		Student Survey	
1.	Ability to understand the chemistry, biological, ecological, and physical concepts necessary to analyze basic environmental engineering problems. (a, b, c, e, f, h, k)	**1.**	Course grade based on homework, exams, lab/field trip reports, and class participation	3.7	Chemistry/biology not traditional strengths of engineers but competence sufficient	4.1	n = 28; Comments focused on shortfalls in pre-requisites involving introductory chemistry coursework
		2.	Quality of in-class discussion				
		3.	Survey of student outcomes				
2.	Ability to understand the processes of pollutant transport and ability to apply mass balance to determine pollutant concentrations in space and time (a, b, e, f, h, k)	**1.**	Course grade based on homework, exams, lab/field trip reports, and class participation	3.4	This improved by moving to the 3rd lecture, strong intro and continued as a theme of the course	4.5	n = 28; Perceived strength of the class
		2.	Quality of in-class discussion				
		3.	Survey of student outcomes				
3.	Ability to understand the important local, regional, and global problems as they relate to air pollution, solid waste management, and water quality (b, e, f, h, j)	**1.**	Course grade based on homework, exams, lab/field trip reports, and class participation	3.9	Insufficient time to cover adequately; given a strong introduction, reinforced with field trip experiences	4.3	n = 28; Students perceived that all material was tied to this outcome but struggle with regulations
		2.	Quality of in-class discussion				
		3.	Survey of student outcomes				
4.	Ability to understand the process of environmental management, including pertinent laws and regulations (e, f, h, j, k)	**1.**	Course grade based on homework, exams, lab/field trip reports, and class participation	3.5	Improved by moving to 2nd lecture and continuing to reference regulations as the class progressed	4.3	n = 28; Students struggle with memorizing regulations but understood the significance
		2.	Quality of in-class discussion				
		3.	Survey of student outcomes				
5.	Ability to communicate effectively about issues in environmental engineering (d, e, f, g, i)	**1.**	Course grade based on homework, exams, lab/field trip reports, and class participation	3.8	Students had many opportunities to write, they improved dramatically, the quality was a pleasant surprise	4.3	n = 28; Commented they still have much to learn about writing and are looking forward to sharpening their skills
		2.	Quality of in-class discussion				
		3.	Survey of student outcomes				

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Course Improvement Suggestions Previous Suggestions		Implementation	Results	Next Level of Improvement
1.	Provide practical examples of how the topics can be used in engineering careers at the beginning of each lecture.	Added a slide to each introduction of topic..	Implemented with fantastic results. Student interest level was substantially improved.	Permanent change to course material. No further action.
2.	Provide an improved laboratory manual.	Edited labs 3 and 4. Contacted Cengage publisher to print new edition.	Less confusion during labs 3 and 4.	Permanent change to course material. No further action.
3.	Improve report rubric to match scoring sheet.	Rubric changes were implemented to better match the scoring sheet and a copy posted to blackboard.	Better performance on lab report scores.	Permanent change to course material. No further action.
4.	Eliminate hand written homework and convert to blackboard self-tests.	Blackboard self-tests were written for each chapter and implemented.	Instant feedback and less time grading were positive outcomes but too few questions.	Permanent change to course material, but still need to add more questions and more instructor feedback.
5.				

Program Improvement Suggestions Previous Suggestions		Implementation	Results	Next Level of Improvement
1.	Should better integrate ENV 3001 with ENV4501, CWR 3201, and CWR 4202, the core water resources/env. courses.	To this end, the lead instructors of these courses have met and synchronized the material.	We developed a plan to address this material because we fell behind in the course that it is usually taught.	Permanent change to course, but followup is needed.
2.	Students complain of lack of knowledgable teaching assistants	A TA training program was implemented online.	Excellent results, TA grading is now standardized across CEGE.	Need to improve the online training course since recordings are no longer on the server.
3.	Lack of lab space and equipment	Targeted proposals sent to Dean's office to compete for teaching equipment grants	Slowly but surely, we are increasing capacity from 4 to 8 stations.	Still need to synchronize the enrollment in the labs.
4.				

Notes