

An Environmental Engineering Curriculum for the New Millennium

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Presentation Outline

- Objectives
- Mercer Background
- MUSE Background
- Program Objectives
- ABET Criteria
- Environmental Curriculum
- Assessment Tools

Objectives

1. Describe the goal and objectives established by the Environmental Engineering Department
2. Present the new comprehensive Environmental Engineering Curriculum
3. Describe the tools used for assessment

Mercer Background

- 1.** Private, Baptist affiliated university founded in 1833
- 2.** Enrollment approximately 7,000 students in undergraduate and graduate programs
- 3.** Main campus located in Macon, Georgia
- 4.** All students must complete one course in religious studies

MUSE Background

- 1.** MUSE: Mercer University School of Engineering was founded in 1985
- 2.** Offers undergraduate degrees in 6 specialty areas: Biomedical, Computer, Electrical, Environmental, Industrial, and Mechanical
- 3.** B.S. degrees in Technical Communications, Industrial Management, and Environmental Systems are also offered by MUSE
- 4.** A Master of Engineering and Master of Science are offered in several areas

Table 1. Criterion 3.

ABET Criteria
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
c) an ability to design a system, component, or process to meet desired needs
d) an ability to function on multi-disciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Environmental Program Goal

- The goal of the Bachelor of Science in Environmental Engineering is to produce graduates who are prepared for employment in professional practice or for graduate study.



Environmental Program Criteria

- Knowledge of fundamental concepts of waste minimization and pollution prevention.
- Understanding of roles and responsibilities of public institutions and private organizations in environmental management.
- Apply environmental systems and process modeling techniques.
- Proficiency in mathematics through differential equation.
- Proficiency in probability and statistics.
- Proficiency in calculus based physics.

Environmental Program Criteria

- Proficiency in general chemistry.
- Proficiency in earth science.
- Proficiency in biological science.
- Proficiency in fluid mechanics.
- Knowledge of introductory level of fundamentals in the following major focus areas: water supply and resources, environmental systems modeling, environmental chemistry, wastewater management, solid waste management, hazardous waste management, atmospheric systems and air pollution control, and environmental and occupational health.

Environmental Program Criteria

- Proficiency in advanced principles and practice in a minimum of three of the major focus areas.
- Understanding of concepts of professional practice such as procurement, bidding versus quality-based selection processes, interaction of project design and construction professionals.
- The importance of professional licensure and continuing education.

Courses to Meet Program Criteria

- Waste minimization & pollution prevention: EVE 290, EVE 402, EVE 405, EVE 420
- Environmental management: EVE 290, EVE 402, EVE 405, EVE 420
- Environmental systems & modeling: EVE 290, EVE 402, EVE 403, EVE 405, EVE 406, EVE 420, EVE 421
- Proficiency in math: MAT 191, EGR 191L, MAT 192, EGR 192L, MAT 330

Courses to Meet Program Criteria

- Probability & statistics: EGR 252
- Calculus based physics: PHY 161, PHY 161L, PHY 162, PHY 162L
- General chemistry: CHM 111, CHM 112
- Earth science: ESC 105 Geology, ESC 110 Meteorology, ESC 210 Environmental Geology
- Biological science: BIO 115 Biology, People, and Society, BIO 210 Introduction to Biology I
- Fluid mechanics: EVE 384 Hydrology and Hydraulics

Courses to Meet Program Criteria

- Focus areas: water supply and resources EVE 290 & 405; environmental systems EVE 403, 405 and 420; environmental chemistry EVE 410; wastewater management EVE 405; solid waste management EVE 420; hazardous waste management EVE 420; atmospheric systems and air pollution control EVE 402 & 403.
- Advanced principles: water supply & resources EVE 406; wastewater management EVE 406; solid waste management EVE 421; hazardous waste management EVE 421; atmospheric systems and air pollution control EVE 403
- Concepts of professional practice: EGR 108 professional practice EVE 460 Environ. Law.

Courses to Meet Program Criteria

- n. Professional licensure and continuing education: EGR 108 Professional Practices and EVE 488 Senior Engineering Design.

Environmental Program

Objective 1

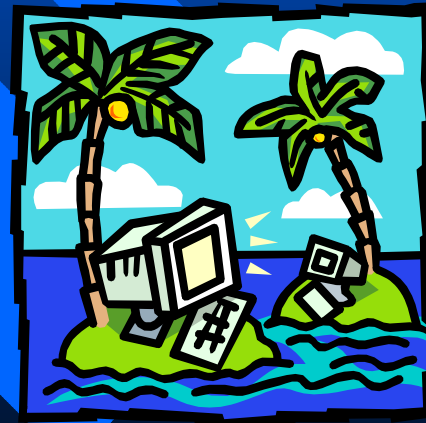
1. Analyze environmental engineering problems related to water/wastewater treatment, air pollution, and solid and hazardous waste issues.



Environmental Program

Objective 2

2. Design solutions and engineering systems using appropriate engineering analysis and evaluation of alternatives to minimize detrimental effects on the environment.



Environmental Program

Objective 3

3. Communicate effectively with technical and non-technical audiences in both written and oral form.



Table 3. New Environmental Engineering Curriculum

Freshman Year

Fall Semester		LEH LBH CH			Spring Semester		LEH		
LBH	CH								
UNV 101	Freshman Experience	1	0	1	EGR 107	Intro to Engr Design	2	2	3
EGR 126	Intro to Prob Solving	3	0	3	EGR 108	Professional Pract	3	0	3
MAT 191	Calculus I	3	0	3	MAT 192	Calculus II	3	0	3
EGR 191L	Calculus Lab I	0	3	1	MAT 192L	Calculus Lab II	0	3	1
CHM 111	General Chemistry I	3	3	4	CHM112	General Chemistry II	3	3	4
FYS 101	First Year Seminar	4	0	4	GAXXX	GA/HSS Elective I	3	0	3
		14	6	16			14	8	17

Sophomore Year

Fall Semester		LEH LBH CH LBH CH			Spring Semester		LEH		
PHY 161	General Physics I	3	0	3	PHY 162	General Physics II	3	0	3
PHY 161L	General Physics I Lab	0	3	1	PHY 162L	Gen. Physics II Lab	0	3	1
MAT 330	Intro to Diff. Equations	3	0	3	EGR 252	Appl. of Eng. Math	3	0	3
EGR 232	Statics/Solid Mechanics	3	0	3	EGR 233	Dynamics	2	0	2
EGR 244	Electrical Fund I	3	2	4	EGR 235	Thermodynamics	3	0	3
EVE 290	Intro to Environ Engr	3	0	3	EGR 245	Electrical Fund II	3	0	3
					EGR 245L	Electrical Fund Lab	0	3	1
					EGR 300	Junior Level Exhibits	0	0	0
		15	5	17			14	6	16

Junior Year

Fall Semester LBH CH		LEH LBH CH			Spring Semester		LEH		
TCO 341	Tech Communication	3	0	3	EGR 386	Engr. Systems Analysis	3	0	3
EGR 312	Engineering Economy	3	0	3	EVE 405	Water /Wastewater Trt.	3	0	3
EVE 384	Hydraulics/Hydrology	3	0	3	EVE 420	Solid Waste Systems Design	3	0	3
EVE 410	Process Chemistry	3	0	3	XXX	Biological or Earth Science	3	3	4
XXX	Biological or Earth Science	3	3	4	GAXXX	GA/HSS Elective II	3	0	3
		15	3	16			15	3	16

Senior Year

Fall Semester LBH CH		LEH LBH CH			Spring Semester		LEH		
EVE 487	Engineering Design Exhibit I	0	6	2	EVE 488	Engineering Design Exhibit II	0	6	2
EVE 406	Adv. Water/WW Trt.	3	0	3	EVE 4XX	Technical Elective	3	0	3
EVE 402	Air Pollution Control	3	0	3	EVE 403	Air Resource Mgt.	3	0	3
EVE 421	Adv. Solid Haz. Waste Management	3	0	3	EVE 460	Environ. Law, Regs, Specifications	3	0	3
EVE 485	Environ & Occup Health	2	0	2	EVE 445L	Environmental Lab	0	3	1
GA XXX	GA/HSS Elective III	3	0	3	GA XXX	GA/HSS Elective IV	3	0	3
						Graduation Exhibit	0	0	0
		14	6	16			12	9	15

Tentative Assessment Strategy

- Course Portfolios
- Junior and Senior Level Exhibits
- External Evaluations
- Student Portfolios
- Faculty Portfolios

Conclusions

- A comprehensive Environmental Engineering curriculum was developed.
- Two courses in water/wastewater, air pollution, and solid and hazardous waste were established to teach fundamentals and advanced principles in each focus area.
- Course portfolios and Jr./Sr. level exhibits will be utilized as the primary assessment mechanisms.