

CURRICULUM PROPOSAL FORM 2000-2001

NON-GENERAL EDUCATION PROCESS A

***DEADLINES:** Deadline dates for 2000/2001 submissions: Regular proposals: October 20, 2000 to be implemented in Fall 2001; Short-Term proposals: December 8, 2000 to be implemented in Fall, 2001; Regular proposals February 16, 2001 to be implemented in Spring, 2002; March 23, 2000 for short-term courses to be implemented in Spring 2002.

PROPOSAL TITLE: Minor Degree in Environment & Society

SPONSOR(S): Marion Institute for Environmental Studies

DEPARTMENT: Chemical Engineering

COLLEGE: Engineering

IF LAS CHECK ONE: History/Humanities Math/Sciences So

Check one: Undergraduate Graduate

THE ATTACHED **NON-GEN-ED** PROPOSAL IS BEST DESCRIBED BY THE ITEM(S) CHECKED.

New non-gen-ed course

Short-term non-gen-ed course

Minor curricular changes (fewer than three) to:

existing non-gen-ed course

non-gen-ed degree requirements

major

minor, specialization, concentration, track, certificate program

DEPARTMENT

(Signature indicates approval)

Dept. Curriculum Chair / Date [Signature] 10-26-00

Dept. Chairperson / Date [Signature] 10-26-00

ACADEMIC DEAN

Approved Not Approved Comments:

Dean's Signature/Date Diane Derland 10/26/00



COLLEGE CURRICULUM COMMITTEE

Date of open hearing (if necessary) _____ Approved Not Approved _____

Comments:

Signature of College Chair/Date: _____

UNIVERSITY CURRICULUM COMMITTEE

Date Received/Processed 4/27/01

Comments:

Curriculum Chair Signature _____ Date Announced At Senate 5-8-01

EXECUTIVE VICE PRESIDENT/PROVOST

Approved Not Approved _____ If no, reasons are as follows:

Student Credit Hours _____ Faculty Load Hours _____ Equalized Credit Hours _____

Official Copy & Approval Sheet Filed (Date): _____ Executive VP/Provost Signature/Date _____

REGISTRAR

Date Approved Course Description Received _____ Hegis Taxonomy & Course Number Assigned _____

Registrar Signature/Date _____

NOTIFICATION FORWARD

Senate Curriculum Committee Chairperson

Academic Dean(s)

Tm
8/13/01

Department Chairpersons

Registrar

Sponsor(s)

Minor Change

1. Details:

- a) **Change:** Change the Course Title, Topics and Catalog Description of Environmental Design in the Process Industries, 0906-520

Current Topics

Introduction to pollution prevention
Process and product modifications

Overall strategies for reducing gaseous, liquid and solid wastes
Process design and management
Source reduction
Recycle and reuse

Process modification to reduce byproducts
Alterations of reactions
Process unit operations
Operating conditions

Process chemistry
Substitution of environmentally-benign raw materials
Solvent substitution
Other process components

Recovery of wastes for economic gain
Recovery and conversion options
Recovery for resale
Recovery for reuse

Process engineering for environmental concerns
Environmental regulations
Economic incentives
Approach to source control problem strategy – air streams
Factors in control equipment selection
Source control of gaseous emissions
Source control of particulate emissions

Recycling and reuse processes – liquid wastes
Water conservation
Solvent recovery

- Material recovery
- Waste segregation
- Zero Discharge

- Waste minimization – liquid waste
 - Concentration processes
 - Process stream modifications
 - Hybrid systems

- On-site handling, storage and processing

- Heat recovery in processing

- Process design application in the process industries

- Organic chemicals I
- Inorganic chemicals
- Petroleum/refining
- Food and beverage
- Pharmaceutical/biotechnology
- Electrochemical/electronics
- Pulp and paper
- Textile
- Agricultural

- Case Studies and student projects

- Life cycle and environmental impact analyses
- Student team projects

Current Catalog Description

Environmental Design in the Process Industries, 0906-520

Prerequisite: Graduate Engineering standing and approval of Graduate Advisor

This course evaluates process design techniques to minimize waste and by-products in the processing and manufacturing industries. Topics include: mass and heat recycling processes; technologies for process stream renovation, material reuse and recycling methods. Case studies of industrial applications are utilized.

New Topics

Chemical Engineer's Guide to Environmental Issues and Regulations:

An introduction to environmental issues. These issues range from global to local and include global warming, stratospheric ozone depletion, smog formation, hazardous waste generation and others.

Environmental risk An introduction to risk and an overview of environmental risk assessment

Environmental regulations An overview of federal regulations in covering the regulation of chemical manufacturing and the regulation of discharges to the air, water and soil. These include The Toxic Substances Control Act, The Federal Insecticide, Fungicide and Rodenticide Act, Occupational Safety and Health Act, Clean Air Act and amendments, Clean Water Act, Resource Conservation and Recovery Act (RCRA), The Comprehensive Environmental Response Compensation and Liability Act (CERCLA), The Emergency Planning and Community Right to Know Act (SARA) and Pollution Prevention Act.

The roles and responsibilities of chemical engineers. These roles and responsibilities include examination of ethics, inherently safer design of chemical processes.

Environmental Risk Reduction for Chemical Processes

This section of the course would begin at molecular level and use molecular properties that are relevant to risk assessment and designing chemical pathways:

Evaluating the environmental fate of chemicals

Evaluating chemical exposures and risk

Green Chemistry

- Designing reaction pathways
- Substitution of environmentally-benign raw materials
- Solvent substitution
- Other process components

The next section would transition from the molecular level to the chemical process level which includes equipment design and selection and process design.

Conceptual design of chemical processes and evaluating environmental performance throughout the design process. This includes prediction of emissions and minimization of risk from these emissions.

Designing chemical processes with improved environmental performance

- Unit Operations
- Flowsheets:

Detailed environmental performance evaluations of flowsheets
Coupled economic and environmental evaluation of flowsheets

Life cycle assessment (Product stewardship)

Industrial Ecology (Material and energy flows in industrial networks)

Case studies and student team projects in chemical process industries:

Organic chemicals I
Inorganic chemicals
Petroleum/refining
Food and beverage
Pharmaceutical/biotechnology
Electrochemical/electronics
Pulp and paper
Textile
Agricultural

Life cycle assessment
Industrial Ecology

New Catalog Description

Green Engineering Design of Chemical Processes 0906-520

Prerequisites: Graduate standing and approval of Graduate Advisor

Green Engineering is the design, commercialization, and use of processes and products, which are feasible and economical while minimizing 1) generation of pollution at the source and 2) risk to human health and the environment. Topics include an introduction to environmental issues and regulations, risk reduction techniques at both molecular and flowsheet levels and life cycle assessment of chemical processes and products. Case studies of industrial applications are utilized.

- b) Sponsor:** Mariano Savelski, Robert P. Hesketh and Chemical Engineering Curriculum Committee
- c) Credit Hours:** 3 semester hours
- d) Course Level:** Graduate
- e) Curricular Effect:** Technical Elective for Engineering Graduate students
- g) Suggested Time/**
Scale of Implementation: 1 section
- h) Resources:** No additional resources will be needed for this minor change

2. Rationale:

1. The proposed name change of this course reflects the current trend that decisions to protect human health and the environment have the greatest impact and cost effectiveness if they are applied early to the design and development phase of a chemical process or product.
2. Green engineering is currently the title used to describe environmental considerations in Process Design.
3. Rowan University is currently heading the EPA funded Green Engineering Program to have aspects of green engineering incorporated in a senior/graduate level course and throughout the curriculum. As part of this program a textbook is being developed. The book is divided into 3 major sections: 1) A chemical Engineer's Guide to Environmental Issues and Regulations 2) Environmental Risk Reduction for Chemical Processes 3) Moving Beyond the Plant Boundary. . The first section provides an overview of major environmental issues, and an introduction to environmental legislation, risk management and risk assessment. The second section contains tools for assessing the environmental profile of chemical processes and the design tools that can be used to improve environmental performance. These tools include release estimation approaches and pollution prevention strategies, total cost accounting, and green process design. This group of chapters begins at the molecular level, examines unit operations, and then proceeds to an analysis of process flowsheets. The final section contains the tools for improving product stewardship and improving the level of integration between chemical processes and other material processing operations.
4. ABET engineering criteria 2000 requires chemical engineering departments to incorporate "ethics, safety and the environment" into the curricula. Additionally, this green engineering course will prepare students with the ABET requirement of preparing students with a *broad education to understand the impact of engineering solutions in a global context*.

The proposed change is consistent with the on-going assessment and review of the College of Engineering's programs of study. The Chemical Engineering program is making some minor changes with courses in response to information obtained from the American Society of Engineering Education and the American Institute of Chemical Engineers.

3. Results of Consultations:

This change will not impact any other engineering program or science program.

Green Engineering of Chemical Processes 0906-520

Prerequisites: Graduate standing and approval of Graduate Advisor

Green Engineering is the design, commercialization, and use of processes and products, which are feasible and economical while minimizing 1) generation of pollution at the source and 2) risk to human health and the environment. Topics include an introduction to environmental issues and regulations, risk reduction techniques at both molecular and flowsheet levels and life cycle assessment of chemical processes and products. Case studies of industrial applications are utilized.