(7)

PROPOSAL SCC #99/00-459

CURRICULUM PROPOSAL FORM 1999-2000

NON-GENERAL EDUCATION PROCESS A

*DEADLINES: Deadline dates for 1999/2000 submissions: Regular proposals: October 22, 1999 to be implemented in Fall 2000; Short-Term proposals: December 10, 1999 to be implemented in Fall, 2000; Regular proposals February 18, 2000 to be implemented in Spring 2001; March 24, 2000 for short-term courses to be implemented in Spring 2001

PROPOSAL TITLE: Industrial Process Pathways

SPONSOR(S): Kevin Dahm

DEPARTMENT: Chemical Engineering

COLLGE: Engineering

0906579

IF LAS CHECK ONE: ____History/Humanities ____Math/Science ____Social/Behavioral Sciences

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 2/24/00

Dept. Chairperson/Date 2-24-00

ACADEMIC DEAN

Approved ✓ Not Approved ____ Comments:

Dean's Signature/Date 2/24/00

SCC 4294

Course Proposal

1. Details:

a) Course Title:	Industrial Process Pathways (0906.579)
b) Sponsor:	Kevin D. Dahm and the Chemical Engineering Curriculum Committee
c) Credit Hours:	3 credit hours
d) Course Level:	Graduate
e) Curricular Effect:	Technical Elective for engineering graduate students
f) Prerequisites:	Graduate standing and approval of Graduate Advisor
g) Suggested Time/ Scale of Implementation:	Fall 2000 1 section
h) Resources:	Faculty have been hired consistent with the College of Engineering multi-year budget. No computer software or laboratory equipment beyond what is currently available will be necessary. Library acquisitions may be required consistent with current acquisition plan.

2. Rationale:

The proposed course is a graduate elective in the College of Engineering. The course will address the area of kinetic modeling of complex reaction systems, focusing on chemical mechanisms that play key roles in industrial product synthesis. Advanced study in the area of kinetics and reaction mechanisms should be of particular interest, since we expect many of our graduate students will come to us from local pharmaceutical/specialty chemical companies.

3. Essence of the Course:

a) Objectives:

Upon completion of the course, students will be able to:

1. Solve open-ended design/research problems.
2. Build mechanistic kinetic models of complex reaction systems.
3. Use sound engineering judgment to approximate unknown information.
4. Have a thorough understanding of free radical chemistry and d-orbital catalysis.
5. Create mechanisms that synthesize desired products using the free radical and d-orbital chemical mechanisms, and optimize these processes.
6. Use ODE solution software to obtain quantitative results from kinetic models.

b) Topical Outline:

The course will be divided into distinct modules, each of which will address a specific class of industrial reactions. The structure of each module will be the same: An overview of the chemistry, methods of determining and modeling the kinetics, and applying this information to the practical problem of process optimization. A sample module is outlined below.

Introduction to Pyrolysis
- Free radical Chemistry
- The Rice-Herzfeld chain mechanism
- Industrial importance

Construction of kinetic models
- Arrhenius rate laws
- Generalized correlations for kinetic parameters
- Relationship between thermochemistry and kinetics
- Algebraic solution methods
- Rigorous solution methods using Ordinary Differential Equations

Process optimization

- Construction of mechanisms
- Sensitivity analysis

The course as currently envisioned would feature modules on pyrolysis and d-orbital catalysis, but other chemical pathways such as Diels-Alder reactions would also be appropriate. The instructor will choose specific modules with consideration for faculty and student preferences as well as current technological advances.

c) Evaluation and Grading Procedure of Students:

Each student will complete an in-depth project in the general area of chemical kinetic modeling, with the specific topic to be chosen by the student, subject to the instructor's approval.

Student grades also will be based examinations, homework, and in-class group assignments. A course syllabus with a stated method of arriving to the final grade, e.g. project, number of exams, projects, homework, percentage of grade, will be distributed to students the first week of classes.

d) Course Evaluation:

The proposed course will be evaluated on the basis of student evaluations and curriculum review by appropriate faculty.

4. Results of Consultations:

Consultations have been made with Chemistry faculty in the Department of Chemistry and Physics, who have provided a letter stating their support.

Catalog Description

Industrial Process Pathways (0906.579)

Prerequisite: Graduate standing and approval of Graduate Advisor

This course will study chemical reaction mechanisms that play crucial roles in the chemical industry. Fundamentals of reaction thermochemistry and reaction kinetics will be discussed. Students will learn to construct mechanistic models of complex, multi-reaction systems, and to apply these models to the solution of practical problems such as yield optimization.