PROPOSAL SCC #99/00- 418

CURRICULUM PROPOSAL FORM 1999-2000

RECEIVED

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.**

0906.479

PROPOSAL TITLE: Industrial Process Pathways: Kinetics and Mechanisms (0906 479)

SPONSOR(S): Kevin D. Dahm

DEPARTMENT: Chemical Engineering

COLLEGE: Engineering

IF LAS CHECK ONE: ___ History/Humanities ___Math/Sciences ___Social/Behavioral Sciences

Check one: X Undergraduate ___Graduate

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

X 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)

Ravi Prabhu Ravichandran 10/25/99

Dept. Curriculum Chair / Date

10-22-99

Dept. Chairperson / Date

ACADEMIC DEAN

Approved ✓ Not Approved ___ Comments:

Dean's Signature/Date

COLLEGE CURRICULUM COMMITTEE

Date of open hearing (if necessary) 12-8-99 Approved ✓ Not Approved _____
Comments:

Signature of College Chair/Date: Ravi Sheth Ramachandran

UNIVERSITY CURRICULUM COMMITTEE

Date Received/Processed 2/3/00
Comments:

Curriculum Chair Signature _____ Date Announced At Senate 2/9/00

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 2/4/00

REGISTRAR

Date Approved Course Description Received _____ Hegis Taxonomy & Course Number Assigned 0900.479

Registrar Signature/Date Robert A. Kubat 2/15/00

NOTIFICATION FORWARD

_____Senate Curriculum Committee Chairperson _____Academic Dean(s)

_____Department Chairpersons _____Registrar _____Sponsor(s)

Course Proposal

1. Details:

a) Course Title:	Industrial Process Pathways: Kinetics and Mechanisms (0906.479)
b) Sponsor:	Kevin D. Dahm and the Chemical Engineering Curriculum Committee
c) Credit Hours:	3 credit hours
d) Course Level:	senior
e) Curricular Effect:	Technical Elective for engineering majors
f) Prerequisites:	Organic Chemistry (1907.200), Chemical Reaction Engineering (0906.316)
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 beyond what is currently available will be necessary. Laboratory equipment will be obtained consistent with the College of Engineering capital budget. Library acquisitions will be required consistent with current acquisition plan.

2. Rationale:

The proposed course is a new offering consistent with other courses in the Engineering Curriculum Proposal approved by the College Senate in December 1994. The proposed course is consistent with the establishment of the College of Engineering approved by the Board of Trustees in February 1995.

The proposed course is a Technical Elective for all Engineering majors and satisfies the Engineering Topics credit requirements of the Education and Accreditation Committee (EAC) of the American Institute of Chemical Engineers (AIChE) for accreditation of the Chemical Engineering program by the Accreditation Board for Engineering and Technology (ABET).

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. It will have sufficient advanced chemistry to count towards the Advanced Chemistry requirement for Chemical Engineering majors.

3. Essence of the Course:

a) Objectives:

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

1. Build effective, mechanistic kinetic models of complex reaction systems.

2. Use ODE solution software to obtain quantitative results from kinetic models.

3. Have a thorough understanding of free radical chemistry and d-orbital catalysis.

4. Create mechanisms that synthesize desired products using the free radical and d-orbital chemical mechanisms, and optimize these processes.

5. Work in teams to solve open-ended design problems.

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:

Student grades will be based on examinations, homework, and in-class group assignments. A course syllabus with a stated method of arriving to the final grade, e.g., 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 initiated with Chemistry faculty in the Department of Chemistry and Physics, who we have asked to provide a letter of reference.

Catalog Description

Industrial Process Pathways (0906.479)

Prerequisite: Organic Chemistry (1907.200), Chemical Reaction Engineering (0906.316)

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.

ROWAN UNIVERSITY

Department of Chemistry and Physics
256-4856

To: Curriculum Commitee
From: Robert Newland, Chair
Subject: Industrial Process Pathways: Kinetics and Mechanisms
Date: November 29, 1999

This Department supports the course named above as a regular addition to the curriculum of the College of Engineering.

cc: Kevin Dahm