KOWAN COLLEGE
CURRICULUM COMMITTEE

(2)

ROPOSAL TITLE: Advanced Design of Reactors C906-465

X UNDERGRADUATE ___ GRADUATE 3 CREDIT HOURS

PONSOR(S): Dr. C. Stewart Slater

EPARTMENT & TELEPHONE# Chemical Engineering x4631

ECK ONE: X COURSE ___ MINOR PROGRAM ___ CONCENTRATION ___ SPECIALIZATION

___ ACHIEVEMENT CERTIFICATE ___ CERTIFICATION PROGRAM ___ MAJOR PROGRAM

STEP #1 (DEPARTMENT)

X APPROVED/DATE: 3-27-97

___ NOT APPROVED/DATE:

DEPT. CURRICULUM CHR.

X REVIEWED/DATE: 3-27-97

DEPT. CHR.

STEP #2 (RECEIPT)

SCC# 9798-4

DATE RECEIVED: 6/97

SENATE CURRICULUM CHR.

STEP #3 (SCHOOL)

REVIEWED DATE: 3-28-97

X RECOMMEND TO APPROVE

___ RECOMMEND NOT TO APPROVE

FORWARD FOR OPEN HEARING

X WITHOUT RESERVATIONS

___ WITH RESERVATIONS

COMMENTS:

TRC TRC RAD JLS

CSS

SCHOOL COMMITTEE CHR.

TEP #4 (ACADEMIC DEAN)

X RECOMMEND

___ NOT RECOMMEND

___ CONDITIONALLY RECOMMEND (SEE COMMENTS)

ATE & SIGNATURE, DEAN OF SCHOOL

COMMENTS:

TEP #5 (SENATE CURRICULUM COMMITTEE)

ATE OF OPEN HEARING 10-9-97

PPROVED BY SENATE CURRICULUM COMMITTEE (DATE) 10-9-97

___ RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS:

TEP #6 (SENATE)

ATE PRESENTED TO SENATE 10-23-97 ✓ APPROVED ___ NOT APPROVED

OTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE) 10-23-97

ENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE Lauretta Reuss

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED _____

APPROVED: ___YES ___NO

I , REASONS ARE AS FOLLOWS:

Spring 2000

STUDENT CREDIT HOURS 3

FACULTY LOAD HOURS 3

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) _____

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST _____

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 8 Jan 98

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 0906.465

DATE/SIGNATURE OF REGISTRAR _____

NOTIFICATION FORWARD:

___SENATE CURRICULUM COMMITTEE CHAIRPERSON

___DEPARTMENT CHAIRPERSON(S)

___ACADEMIC DEAN(S)

___REGISTRAR

___SPONSOR(S)

Transmittal 1/23/98

S-6 DISK CURRICULUM
EGCRS.FRM (C)

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Course Proposal

1. Details:

a) Course Title:	Advanced Design of Reactors (0906.465)
b) Sponsor:	Dr. C. Stewart Slater, Chemical Engineering
c) Credit Hours:	3 credit hours
d) Course Level:	Senior
e) Curricular Effect:	Technical Elective for Chemical Engineering students
f) Prerequisites:	Chemical Reaction Engineering
g) Suggested Time/ Scale of Implementation:	Spring 2000 1 section
h) Resources:	Faculty will be hired consistent with Engineering School multi-year budget. No computer software beyond what is currently being acquired for approved course will be necessary. Library acquisitions will be required consistent with current acquisition plan.

2. Rationale:

The proposed course is a technical elective in the School of Engineering and is consistent with the establishment of the School of Engineering approved by the Board of Trustees in February 1995. The proposed course is part of the Chemical Engineering Program and meets requirements of the Education and Accreditation Committee (EAC) of the American Institute of Chemical Engineers (AIChE) for accreditation of programs by the Accreditation Board for Engineering and Technology (ABET).

The course will address the advanced engineering aspects of reactor design. The foundation provided by the required course Reaction Engineering will be expanded upon with more complex problems and industrial scenarios. The course will provide students with the application of advanced mathematical techniques to novel reactor design thus enhancing their education beyond the required course, Reaction Engineering.

3. Essence of the Course:

a) Objectives:

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

1. Apply advanced concepts of kinetic to complex reactor design.

2. Determine models for heterogeneous catalytic processes.

3. Analyze physical/chemical characteristics of catalysts and their effect on transport and reaction.

4. Model and design multiphase reactors.

5. Use computer software (from CACHE and other sources) to analyze complex reaction engineering problems.

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

b) Topical Outline:

The topics to be covered are listed below. The instructor will supply the students with a syllabus during the first week of classes. The instructor will assess any technology advances in the subject matter prior to the course and make topic changes as deemed appropriate to maintain the level and currency of instruction.

Elements of reaction kinetics
- Review of basic principles
- Complex reactions
- Influence of temperature

Kinetics of heterogeneous catalytic reactions
- Adsorption on solid catalysts
- Rate equations
- Model discrimination and parameter estimation

Interfacial gradient effects and transport with reactions catalyzed by solids
- Reaction of a component of a fluid at a solid surface
- Mass and heat transfer resistances
- Concentration or partial pressure and temperature differences

Intraparticle gradient effects and transport with reactions catalyzed by solids
- Catalyst internal structure
- Pore diffusion
- Diffusion and reaction inside catalyst particle
- Complex reactions in the presence of diffusional limitations
- Nonisothermal particles

Noncatalytic gas-solid reactions
- General models for interfacial and intraparticle gradients
- Complex models

Catalyst deactivation
- Kinetics and catalyst poisoning
- Kinetics and catalyst deactivation by coking

Gas-liquid reactions
- Models for transfer at gas-liquid interface
- Two-film theory
- Surface renewal theory
- Experimental determination of the kinetics of gas-liquids reactions

Advanced analysis and design of chemical reactors
- Mass, energy and momentum balances
- Batch and semibatch reactor modeling
- Plug flow reactor modeling
- Perfectly mixed reactor modeling
- Commercial development in the chemical industry

Fixed bed catalytic reactors
- Fixed bed industrial catalytic process
- Pseudohomogeneous models
- Heterogeneous models
- Industrial cases

Specialized cases
- Fluidized bed and transport reactors
- Multiphase flow reactors

c) Evaluation and Grading Procedure of Students:

Student grades will be based on examinations and homework. A course syllabus with a stated method of arriving 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 made with Chemistry faculty in the Department of Chemistry and Physics who have provided a letter of support.

Catalog Description

Advanced Design of Reactors (0906.465)
Prerequisite: Chemical Reaction Engineering

This course presents an overview of chemical reaction types and ideal reactors. Topics presented include: catalysis and catalytic reactors; analogies for real reactors; fluid flow and heat and mass transfer effects on chemical reactions and reactor design; numerical analyses and simulation of reacting systems; applications in the chemical industry.

Rowan College *of* New Jersey
Glassboro, NJ 08028-1701 • 609/256-4855

Department of Chemistry and Physics

To: Curriculum Committee
From: Robert Newland, Chairperson
Subject: Chemical Engineering Technical Electives
Date: February 15, 1996

I have examined the course proposals listed below and find them in accord with the previously submitted curriculum plan. I also have noted where courses require chemistry and /or physics prerequisites and am convinced there are no additional resources required to meet this demand for our courses. We fully support these proposals.

Electrochemical Engineering
Environmental Regulations in Technology Industries
Environmental Considerations in Process Design
Process Safety
Membrane Process Technology
Advanced Separation Technology
Process Heat Transfer
Fluid Flow in Processing and Manufacturing
Advanced Reactor Design
Bioprocess Engineering
Transport Phenomena