ROWAN COLLEGE
CURRICULUM COMMITTEE

PROPOSAL TITLE: Advanced Separation Process Technology

___UNDERGRADUATE X GRADUATE 3 CREDIT HOURS

SPONSOR(S): C. Stewart Slater x4631

DEPARTMENT & TELEPHONE# Chemical Engineering

CHECK 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# 9798-2

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.

STEP #4 (ACADEMIC DEAN)

X RECOMMEND

___NOT RECOMMEND

___CONDITIONALLY RECOMMEND (SEE COMMENTS)

DATE & SIGNATURE, DEAN OF SCHOOL

COMMENTS:

Pay ?? SCC# Same

STEP #5 (SENATE CURRICULUM COMMITTEE)

DATE OF OPEN HEARING 10-9-97

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

___RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS:

STEP #6 (SENATE)

DATE PRESENTED TO SENATE 10-24-97 ___APPROVED ___NOT APPROVED

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

SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE Lucretta Reeves

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED _____

APPROVED: ___YES ___NO

IF NO, REASONS ARE AS FOLLOWS:

STUDENT CREDIT HOURS 3 Spring 98

FACULTY LOAD HOURS 3

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) _____

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST _____

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 28 Oct. 97

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 0916.516

DATE/SIGNATURE OF REGISTRAR B L Kelsey

NOTIFICATION FORWARD:

___SENATE CURRICULUM COMMITTEE CHAIRPERSON

___DEPARTMENT CHAIRPERSON(S)

___ACADEMIC DEAN(S)

___REGISTRAR

___SPONSOR(S)

\CURRIC6X.DOC\

Course Proposal

1. Details:

a) Course Title:	Advanced Separation Process Technology
b) Sponsor:	Dr. C. Stewart Slater, Chemical Engineering
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 advisor
g) Suggested Time/ Scale of Implementation:	Spring 1998 1 section
h) Resources:	Faculty are present to teach this course. No additional equipment beyond what is currently being purchased for undergraduate programs will be required. Library acquisitions will be required consistent with current acquisition plan.

2. Rationale:

The proposed course is a graduate offering in the School of Engineering and consistent with establishment of the School of Engineering approved by the Board of Trustees in February 1995.

The course will address modern/advanced separation process technology not covered in traditional mass transfer and separation process courses. This course is an essential to have as an elective for students to provide the added depth to the graduate offerings. Process technology learned in this course will enable students to be better prepared to develop and design modern separation systems. Modern separation processes are critical to the quality of life in many areas such as health care, air and water quality, food and beverage processing, and consumer products production.

3. Essence of the Course:

a) Objectives:

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

1. Understand the governing mechanism and driving force of various advanced separation processes.

2. Understand the importance of modern separations in terms of economics and commercial development.

3. Perform process and design calculations on crystallization and precipitation processes.

4. Perform process and design calculations on adsorption and chromatography processes.

5. Perform process and design calculations on ion exchange

6. Perform process and design calculations on membrane processes of reverse osmosis, gas permeation, ultra/microfiltration.

7. Work in groups 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.

Advanced separation process overview
- Importance of modern separations
- Innovation research and optimization research
- Economics and commercial development

Crystallization and precipitation from solution
- Solubility
- Equipment types
- Process yield calculations
- Phase equilibria and single stage systems
- Fractional crystallization
- Precipitation
- Nucleation and crystal growth
- Population balances and crystal size distributions

Crystallization form the melt
- Fundamentals of melt crystallization
- Slurry processes
- Continuous solid phase

Sorption in packed beds
- Adsorbents and packing structure
- Adsorption equilibrium
- Solute movement theories
- Effects of thermodynamic variables

Linear theories of sorption and chromatography
- Types of chromatography

- Solute movement theories
- Large-scale chromatography

Non-linear theories of packed bed adsorption systems
- Mass transfer zone approach
- Constant pattern solutions
- Mass transfer correlations

Adsorption-desorption operations
- Thermal desorption of gases
- Activated carbon solvent recovery systems
- Pressure swing and vacuum swing adsorption
- Regeneration with purge and desorbent

Ion exchange
- Basics of ion exchange
- Ion exchange resins
- Ion exchange equilibrium
- Ion movement theory
- Commercial applications

Membrane processes
- Review of membrane separations
- Membrane materials and process configurations

Reverse osmosis
- Mass transfer analysis
- Design parameters
- Applications

Ultrafiltration and microfiltration
- Mass transfer analysis
- Design parameters
- Applications

Gas Permeation
- Commercial system design

Pervaporation and vapor permeation
- Mass transfer analysis
- Design parameters
- Applications

Introduction to other advanced separation methods
- Supercritical fluid extraction

Electrophoresis
Field-induced separations
Affinity separations
Hybrid systems

c) Evaluation and Grading Procedure of Students:

Student grades will be determined based on examinations, homework and a required project. 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:

The proposed course is part of the Engineering Curriculum Proposal approved by the Faculty Senate in December 1994. Consultations were submitted with original proposal as specified by the Curriculum Committee. Consultations have been made with Chemistry faculty in the Department of Chemistry and Physics who have provided a letter of support.

Catalog Description

Advanced Separation Process Technology (0906.516)

(Prerequisite: Graduate standing and approval of advisor)

This course describes advanced separation processes such as: crystallization and precipitation; adsorption, chromatography and ion exchange; reverse osmosis, ultrafiltration, gas permeation and pervaporation. Commercial system design parameters and laboratory demonstrations will be included. An overview of other novel separation processes will be done.

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