(1)

ROWAN COLLEGE
CURRICULUM COMMITTEE

PROPOSAL TITLE: SEPARATION PROCESSES CHE 4/01

X UNDERGRADUATE ___ GRADUATE 4 (w/lab) CREDIT HOURS

SPONSOR(S): C. Stewart Slater and School of Engineering Curriculum Committee

DEPARTMENT & TELEPHONE# Chemical Engineering, x4631

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

___ ACHIEVEMENT CERTIFICATE ___ CERTIFICATION PROGRAM ___ MAJOR PROGRAM

STEP #1 (DEPARTMENT)

___ APPROVED/DATE:

___ NOT APPROVED/DATE:

N/A
DEPT. CURRICULUM CHR.

___ REVIEWED/DATE:

N/A
DEPT. CHR.

STEP #2 (RECEIPT)

SCC# 13

DATE RECEIVED:

SENATE CURRICULUM CHR.

STEP #3 (SCHOOL)

REVIEWED DATE: 2-14-96

X RECOMMEND TO APPROVE

___ RECOMMEND NOT TO APPROVE

FORWARD FOR OPEN HEARING

X WITHOUT RESERVATIONS

___ WITH RESERVATIONS

COMMENTS:

SCHOOL COMMITTEE CHR.

STEP #4 (ACADEMIC DEAN)

COMMENTS:

✓ RECOMMEND

___ NOT RECOMMEND

___ CONDITIONALLY RECOMMEND (SEE COMMENTS)

DATE & SIGNATURE, DEAN OF SCHOOL 2/16/96

STEP #5 (SENATE CURRICULUM COMMITTEE)

DATE OF OPEN HEARING 9/23/96

APPROVED BY SENATE CURRICULUM COMMITTEE (DATE) 9/23/96

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

STEP #6 (SENATE)

DATE PRESENTED TO SENATE 9/25/96 ___ APPROVED ___ NOT APPROVED

NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE) 9/26/96

SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE 9/26/96

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED _____

APPROVED: ____YES ___NO

IF NO, REASONS ARE AS FOLLOWS:

STUDENT CREDIT HOURS _____

FACULTY LOAD HOURS _____

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) _____

SIGNATURE,EXECUTIVE VICE PRESIDENT/PROVOST _____

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 14 May 97

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 1906.401

DATE/SIGNATURE OF REGISTRAR BJ Kelsey

NOTIFICATION FORWARD:

___SENATE CURRICULUM COMMITTEE CHAIRPERSON

___DEPARTMENT CHAIRPERSON(S)

___ACADEMIC DEAN(S)

___REGISTRAR

___SPONSOR(S)

95-96-118

\CURRIC4A.WPD\

Course Proposal

1. Details:

a) Course Title:	Separation Processes
b) Sponsor:	School of Engineering Curriculum Committee Dr. C. Stewart Slater, Chemical Engineering
c) Credit Hours:	4 credit hours (lecture and laboratory)
d) Course Level:	Senior (0906.401)
e) Curricular Effect:	Requirement for Chemical Engineering majors
f) Prerequisites:	Fluid Mechanics, Math for Engineering Analysis II, Transfer Processes I&II, Applied Chemical Thermo.
g) Suggested Time/ Scale of Implementation:	Fall 1999 1 section
h) Resources:	Faculty will be hired and laboratory equipment obtained consistent with Engineering School multi-year budget. Library acquisitions will be required.

2. Rationale:

The proposed course is part of the Engineering Curriculum Proposal approved by the College Senate in December 1994. The proposed course is consistent with the establishment of the School of Engineering approved by the Board of Trustees in February 1995. The title has been modified slightly for clarity purposes.

The proposed course is a Chemical Engineering Program Criteria requirement of the Education and Accreditation committee (EAC) of the American Institute of Chemical Engineers (AIChE) for accreditation of the program by the Accreditation Board for Engineering and Technology (ABET). The course will build on the concepts covered in the earlier Core course: Transfer Processes.

The area of separation technology is crucial for students obtaining a chemical engineering degree. Students need to learn the basic fundamentals of how a separation technique is used to purify, concentrate and fractionate a process stream. This technology is vital to many of the areas of chemical engineering such as organic and inorganic production, energy and environmental management and petroleum refining. Students need to learn about separation processes since they typically account for >50% of a give production facility cost and therefore have a significant economic impact on final product cost.

3. Essence of the Course:

a) Objectives:

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

1. Classify separation and mass transfer processes by various methods.

2. Understand the difference between equilibrium stage and rate controlled separations.

3. Utilize analytical, graphical and computer methods to solve stage-wise separation operations.

4. Perform scale-up and design calculations on continuous equilibrium operations of distillation, absorption and stripping.

5. Analyze the mass transfer/diffusional aspects of membrane operations of reverse osmosis and gas permeation.

6. Use process simulation software for commercial-scale separation processes.

7. Work in groups to solve open-ended design problems.

8. Understand the operational parameters of processes such as distillation, absorption, stripping, reverse osmosis, gas permeation through hands-on pilot-scale laboratory experience.

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.

Introduction and classification of separations

Vapor-liquid phase equilibrium
- Form and sources of equilibrium data
- Graphical representation of equilibrium data
- Bubble-point and dew-point temperature calculations

Flash distillation
- Binary flash distillation
- Multicomponent flash distillation

Column distillation
- Distillation equipment and cascades
- External column balances
- Internal stage-by-stage balances for binary systems
- McCabe-Thiele method (graphical)
- Lewis method (analytical)

Multicomponent distillation
- Calculation difficulties
- Stage-by-stage calculations
- Shortcut methods for approximate solution
  - Fenske, Underwood, Gilliland methods

Staged and packed column design
- Staged column equipment descriptions
- Packed column equipment descriptions

Absorption and stripping
- Absorption and stripping equilibria
- Operating lines for absorption and stripping analysis
- Analytical solution - Kremser equations

Membrane processes
- Overview of membrane-based operations
- Reverse osmosis
- Gas permeation

Sorption processes
- Overview of sorption processes

Laboratory experiments
- Distillation
- Absorption and stripping
- Extraction
- Reverse osmosis
- Gas permeation

c) Evaluation and Grading Procedure of Students:

Student grades will be based on examinations, homework and/or projects. A course syllabus with a stated method of arriving the final grade, e.g., number of exams, projects, homework, laboratory experiments/reports 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

Separation Processes (0906.401)

(Prerequisites: Fluid Mechanics, Transfer Processes I&II, Applied Chemical Thermodynamics, Math for Engineering Analysis II)

This course studies the principles, design and application of mass transfer separation processes. Equilibrium staged operations are presented with and emphasis on the application of analytical, graphical, and computer methods to the design of stagewise separation processes. Course topics include: binary and multicomponent distillation, absorption and stripping. The course provides an introduction to rate-controlled processes , such as membrane and sorption processes, and their design. Pilot-scale laboratory experiment in distillation, absorption, gas permeation and reverse osmosis will be conducted.

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 Senior-level required courses
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 or the prerequisites require such courses and am convinced there are no additional resources required to meet this demand for our courses. We fully support these proposals.

Separation Processes
Process Dynamics and Control
Chemical Reaction Engineering
Chemical Plant Design