

Fall 96

12

ROWAN COLLEGE CURRICULUM COMMITTEE

PROPOSAL TITLE: Membrane Process Technology

UNDERGRADUATE X GRADUATE 3 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# 1596-143 DATE RECEIVED: 2-21-96 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 J. P. Sawyer 2/16/96

STEP #5 (SENATE CURRICULUM COMMITTEE) DATE OF OPEN HEARING APPROVED BY SENATE CURRICULUM COMMITTEE (DATE) RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS:

STEP #6 (SENATE) DATE PRESENTED TO SENATE 4-24-96 APPROVED NOT APPROVED NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE) SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED MAY 17 1996

APPROVED:  YES  NO

IF NO, REASONS ARE AS FOLLOWS:

STUDENT CREDIT HOURS 3

FACULTY LOAD HOURS 3

EQUALIZED CREDIT HOURS \_\_\_\_\_

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) 5/20/96

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST [Signature]

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 5/30/96

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 0906.508

DATE/SIGNATURE OF REGISTRAR 132 Keturung

NOTIFICATION FORWARD:

\_\_\_ SENATE CURRICULUM COMMITTEE CHAIRPERSON

\_\_\_ DEPARTMENT CHAIRPERSON(S)

\_\_\_ ACADEMIC DEAN(S)

\_\_\_ REGISTRAR

\_\_\_ SPONSOR(S)

## *Course Proposal*

### **1. Details:**

- |  |  |
|--|--|
| <b>a) Course Title:</b>                                | Membrane Process Technology  |
| <b>b) Sponsor:</b>                                     | School of Engineering Curriculum Committee;<br>Dr. C. Stewart Slater, Chemical Engineering   |
| <b>c) Credit Hours:</b>                                | 3 credit hours   |
| <b>d) Course Level:</b>                                | Graduate   |
| <b>e) Curricular Effect:</b>                           | Technical Elective for Engineering graduate students   |
| <b>f) Prerequisites:</b>                               | Graduate Engineering standing and approval of Grad. Advisor  |
| <b>g) Suggested Time/<br/>Scale of Implementation:</b> | Fall 1996<br>1 section   |
| <b>h) Resources:</b>                                   | Faculty are present to teach this course. Library resources will be supplemented by instructor for the first offering of the course. Future acquisitions will be required. |

### **2. Rationale:**

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

The course will address membrane process technology beyond the fundamentals taught in an undergraduate offering. This course is an essential to have as an elective for students to provide the added depth to the program. Process engineering learned in this course will enable students to be better prepared to develop and design modern separation systems. Membrane processes are utilized in many industries for waste minimization, reuse/recovery, and ultrapurification. The course will give students a course that serves the two technology focus groups of Environmental and Manufacturing/Processing Engineering.

### **3. Essence of the Course:**

#### **a) Objectives:**

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

1. Understand the fundamental transport mechanism of membrane processes.
2. Determine the difference between various membrane operations in terms of the driving force utilized and the components being separated.
3. Comprehend various membrane manufacturing and characterization techniques.

4. Select the appropriate membrane material for the separation desired.
5. Specify module configuration and overall system design.
6. Understand the theory, design and application of reverse osmosis, nanofiltration, ultrafiltration, microfiltration, dialysis, electromembrane processes, gas permeation, and Pervaporation.
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.

Introduction

- History
- Definition of a membrane
- Nomenclature

Membrane process overview

- Components separated
- Driving force
- Mechanism of transport

Membrane materials and structure

- Porous and non porous materials
- Polymers, ceramics and metallic material properties
- Membrane characterization
- Membrane fabrication

Membrane process design

- Module configuration
- System design arrangements

Principles, design and applications of unit processes

- Reverse osmosis
- Nanofiltration
- Ultrafiltration
- Microfiltration
- Dialysis
- Electromembrane processes
- Gas permeation

Pervaporation  
Liquid membranes  
Novel and hybrid systems

Laboratory demonstrations

**c) Evaluation and Grading Procedure of Students:**

Student grades will be 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 based on student evaluations and curriculum review by appropriate faculty.

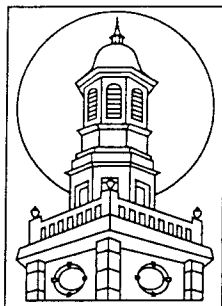
**4. *Results of Consultations:***

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

### ***Catalog Description***

Principles of membrane processes: reverse osmosis, ultrafiltration, microfiltration, electrodialysis, pervaporation, gas permeation, and their application to traditional and emerging fields. Membrane materials and structure. Mass transfer and design aspects for both liquid and gas separation systems.

(Prerequisite: Graduate standing)



## Rowan College of New Jersey

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*Department of Chemistry and Physics*

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

A handwritten signature in black ink, appearing to read 'R. Newland', positioned to the right of the 'From:' line.

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