

ROWAN UNIVERSITY CURRICULUM PROPOSAL

2

PROPOSAL TITLE:

Unit Operations (0906.403)

CHECK APPROPRIATE:  UNDERGRADUATE  GRADUATE  3 SEMESTER HOURS

SPONSOR(S): Dr. C. Stewart Slater and the Chemical Engineering Curriculum Committee

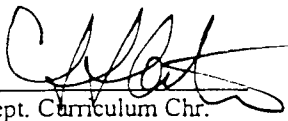
DEPARTMENT/TELEPHONE # Chemical Engineering x4631

CHECK ONE:  COURSE  MINOR PROGRAM  CONCENTRATION  SPECIALIZATION  
 ACHIEVEMENT CERTIFICATE  CERTIFICATION PROGRAM  MAJOR PROGRAM

Step #1 (Department)

Approved (Date) 10-20-97

Not Approved (Date)

  
Dept. Curriculum Chr.

10-20-97  
Reviewed (Date)

  
Dept. Curriculum Chr.

Step #2 (Receipt)

SCC# 97-98-23

10-21-97  
Date Received Senate

Senate Curriculum Chr.

Step #3 (School)

Reviewed Date: 10-27-97

Recommend to Approved

Recommend NOT to Approve

Forward for Open Hearing:

WITHOUT Reservations

WITH Reservations:

Comments:

  
School Committee Chr.

Step #4 (Academic Dean):  Recommended  NOT Recommended  Conditionally Recommended (See Comments)

Comments:

Dean Signature/Date  10-27-97

Step #5 (Senate Curriculum Committee): Open Hearing Date: 11-4-97 Approved by Curriculum Committee Date 11-4-97

Returned to Sponsor(s) for the following reason:

Step #6 (Senate) Date announced/voted on at Senate 11-25-97 If voted on:  Approved  NOT Approved

Date forwarded to Executive Vice President/Provost 11-25-97

Senate Curriculum Committee chair Signature/Date: \_\_\_\_\_

Step #7 (Executive Vice President/Provost): Date Received Jul 1 1997

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 Vice President/Provost Signature [Signature]

**Registrar**

Date Approved Course Description Received 8 Jan 98

Regis Taxonomy and Course Number Assigned 0906-403

Date/Signature of Registrar [Signature]

**Notification Forward:**

\_\_\_\_\_ Senate Curriculum Committee Chairperson

\_\_\_\_\_ Department Chairpersons

\_\_\_\_\_ Academic Dean(s)

\_\_\_\_\_ Registrar

\_\_\_\_\_ Sponsor(s)

*Transmittal  
1/23/98*

## *Course Proposal*

### *1. Details:*

- |  |  |
|--|--|
| <b>a) Course Title:</b>                                | Unit Operations (0906.403)   |
| <b>b) Sponsor:</b>                                     | Dr. C. Stewart Slater, and Chemical Engineering<br>Curric. Com. (C. S. Slater, Z. Otero-Keil, R. P. Hesketh)   |
| <b>c) Credit Hours:</b>                                | 3 credit hours   |
| <b>d) Course Level:</b>                                | Senior   |
| <b>e) Curricular Effect:</b>                           | Requirement for Chemical Engineering students  |
| <b>f) Prerequisites:</b>                               | Chemical Reaction Engineering, Transfer Processes I & II,<br>Chemical Engineering Thermodynamics<br>co-requisite: Separation Processes   |
| <b>g) Suggested Time/<br/>Scale of Implementation:</b> | Fall 1999<br>1 section   |
| <b>h) Resources:</b>                                   | Faculty will be hired consistent with the College of<br>Engineering multi-year budget. No computer software<br>beyond what is currently being acquired for approved<br>course will be necessary. Laboratory equipment will be<br>obtained consistent with the College of Engineering capital<br>budget. Library acquisitions will be required consistent<br>with current acquisition plan. |

### *2. Rationale:*

The proposed course is a requirement in the College of Engineering and is consistent with the establishment of the College 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 fundamental operation and applications of various chemical engineering unit processes, typically called "unit operations." Students will engage in pilot-scale process experimentation on various systems and relate theory and phenomenological principles to performance of a realistic industrial operation.

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

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

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

1. Understand the operation and functionality of various pilot-scale chemical engineering unit process such as plate-and-frame filtration, tubular flow reactors,

liquid-liquid extraction, fluidized beds, continuous distillation, crystallization, leaching, reverse osmosis, gas permeation, absorption and stripping, spray dryers, etc.

2. Determine the relationship between various design features and individual chemical process system performance.
3. Verify the underlying theoretical and empirical relationships with actual performance data on pilot scale process systems.
4. Understand the role of technicians and operators in the operation and data collection function of chemical processes.
5. Apply the principles of safety and haz-op analysis to pilot scale chemical unit operations
6. Use computer software (from CACHE and other sources) to analyze and correlate data from various pilot-scale chemical engineering unit processes.
7. Prepare reports that describe the performance of a chemical unit process in terms of the key operating parameters: pressure, flow rate, temperature, composition, concentration, etc.
8. Work in teams to solve open-ended experimental 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.

*A lecture/lab format is utilized, course is taught as one 6 hour period/week to maximize time for laboratory experiments, 6 Contact hours/wk*

#### Lecture topics

- Introduction to Chemical Process Unit Operations
  - Classification of various unit processes
  - Size and function

- Safety and Haz-Op Analysis
  - Pilot plant safety
  - Storage, handling, use and disposal practices
  - Hazards and operating analysis of chemical processing equipment

- Introduction to each experimental system

Principles, design and applications

Application of data collection and analysis to unit operations

Review of data correlation and presentation (graphing and tables)

Statistical error analysis

Laboratory Experiments

*(Groups rotate among the laboratory experiments)*

Plate-and-frame filtration

Tubular flow reactors

Liquid-liquid extraction

Fluidized beds

Continuous distillation

Crystallization or Leaching

Reverse osmosis

Gas permeation

Absorption and stripping

Spray drying

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

Student grades will be based on laboratory experimentation and lecture material. Required laboratory reports will be graded on technical and merit and organization and clarity. Laboratory preparation and performance will be included in the lab grade. A course syllabus with a stated method of arriving the final grade, e.g., number of experiments, other out of class assignments and in-class work, 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:**

This course is neither a requirement or elective in any other program, and does not impact on required prerequisite course offerings of any other program. Therefore, no consultations have been sought.

## *Catalog Description*

### **Unit Operations (0906.403)**

*Prerequisite: Chemical Reaction Engineering, Transfer Processes I & II, Chemical Engineering Thermodynamics, Co-requisite: Separation Processes*

This course addresses the fundamental operation and applications of various chemical engineering unit processes, typically called “unit operations.” Students will engage in pilot-scale process experimentation on various systems and relate theory and phenomenological principles to performance of a realistic industrial operation. Typical processes covered process filtration, tubular flow reactors, liquid-liquid extraction, fluidized beds, continuous distillation, crystallization, leaching, reverse osmosis, gas permeation, absorption and stripping, spray dryers.