

ROWAN COLLEGE CURRICULUM COMMITTEE

PROPOSAL TITLE: Chemical Plant Design 0906-4-06

X UNDERGRADUATE 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

Table with 3 columns: STEP #1 (DEPARTMENT), STEP #2 (RECEIPT), STEP #3 (SCHOOL). Includes fields for APPROVED/DATE, SCC#, DATE RECEIVED, REVIEWED DATE, and various recommendation options.

STEP #4 (ACADEMIC DEAN) COMMENTS: RECOMMEND NOT RECOMMEND CONDITIONALLY RECOMMEND (SEE COMMENTS) DATE & SIGNATURE, DEAN OF SCHOOL

STEP #5 (SENATE CURRICULUM COMMITTEE) DATE OF OPEN HEARING 9/23/96 APPROVED BY SENATE CURRICULUM COMMITTEE (DATE) 9/20/96 RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS:

STEP #6 (SENATE) DATE PRESENTED TO SENATE 9/20/96 APPROVED NOT APPROVED NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE) 9/20/96 SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE Ronald J. Gordon 9/25/96

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED 10 2 1996

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 [Signature]

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 14 Mar 97

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 0906-406

DATE/SIGNATURE OF REGISTRAR B. J. Kelly

NOTIFICATION FORWARD:

SENATE CURRICULUM COMMITTEE CHAIRPERSON

DEPARTMENT CHAIRPERSON(S)

ACADEMIC DEAN(S)

REGISTRAR

SPONSOR(S)

**Course Proposal****1. Details:**

- a) Course Title:** Chemical Plant Design  
**b) Sponsor:** School of Engineering Curriculum Committee  
 Dr. C. Stewart Slater, Chemical Engineering  
**c) Credit Hours:** 3 credit hours  
**d) Course Level:** Senior (0906.406)  
**e) Curricular Effect:** Requirement for Chemical Engineering majors  
**f) Prerequisites:** Separation Processes and Chem. 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.  
 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 proposed course synthesizes several previous courses in the program as the chemical engineering curriculum builds to the senior year. This course will bridge the gap between the understanding of individual processes in courses such as Separation Processes and how they are integrated into an overall production facility. The course integrates the topics of economics, environment, and energy in a unifying way in plant design. This course is an essential element of the chemical engineering curriculum and the technology focus group. Students need a course like this to successfully work for a major design/engineering firm or for a large chemical/petroleum concern.

**3. Essence of the Course:****a) Objectives:**

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

1. Understand various approaches to conceptual process design.
2. Use economic principles in process design selection.
3. Write a process flowsheet with input/output criteria and recycle structure.
4. Develop a flowsheet with reactor, multiple/series separators and heat exchanger networks.
5. Utilize process cost diagrams and quick screening of process alternatives.
6. Use various commercial software packages for process optimization and design.
7. Work in groups to solve open-ended capstone design problems and present their results to faculty and their peers.

**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 to process synthesis and analysis
  - Creative aspects of plant design
  - Hierarchical approach to conceptual design

- Economic decision making in process design
  - Estimating capital and operating costs
  - Process profitability
  - Simplified economic analysis
  - Case study for equipment design -
    - material & energy balances and cost

- Developing a process flowsheet
  - Batch vs. continuous
  - Input-output structure
  - Stream design variables, balances and costs
  - Recycle structure

- Developing a conceptual design
  - Equilibrium limitations
  - Compressor design
  - Reactor design
  - Separation system
    - Vapor recovery

- Liquid separations
- Heat exchanger networks
  - Minimum heating and cooling
  - Heat and power integration
- Process integration and alternatives
- Process cost diagrams
- Quick screening methodology

- Computer aided design tools and applications
  - Preliminary process optimization
  - Process retrofits
  - Computer-aided design programs
  - Application of computer aided design to industrial cases

**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:**

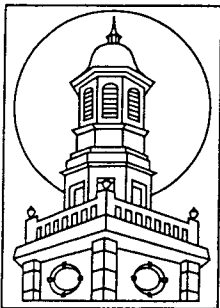
The proposed course is part of the Engineering Curriculum Proposal approved by the Faculty Senate in December 1994. Consultations were submitted with original proposal as specified by the Curriculum Committee. Consultations have been made with Chemistry faculty in the Department of Chemistry and Physics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

### ***Catalog Description***

Chemical Plant Design (0906.406)

*(Prerequisites: Separation Processes and Chemical Reaction Engineering)*

The course will focus on design strategy for process synthesis and analysis and economic decision making in process design. The course explores the development of a conceptual design and optimal flowsheet. Process integration and optimization of reactors, compressors, separators and heat exchangers are discussed. Cost diagrams and quick screening of process alternatives are utilized. The course will use computer-aided process design software for industrial cases.



**Rowan College of New Jersey**  
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*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