**PROPOSAL TITLE:**

Chemical Process Component Design (0906.314)

**CHECK APPROPRIATE:**
- [X] UNDERGRADUATE
- [ ] GRADUATE
- [ ] SEMESTER HOURS

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

**DEPARTMENT/TELEPHONE #**
Chemical Engineering X 4631

**CHECK ONE:**
- [X] COURSE
- [ ] MINOR PROGRAM
- [ ] CONCENTRATION
- [ ] SPECIALIZATION
- [ ] ACHIEVEMENT CERTIFICATE
- [ ] CERTIFICATION PROGRAM
- [ ] MAJOR PROGRAM

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**Step #1 (Department)**

- [✓] Approved (Date) 10-20-97
- [ ] Not Approved (Date)

Dept. Curriculum Chair

**Step #2 (Receipt)**

- [✓] SCC# 97-98-72
- [ ] 10-21-97
- [ ] Date Received Senate

Senate Curriculum Chair

**Step #3 (School)**

- [✓] Recommended
- [ ] Recommend NOT to Approve
- [✓] WITHOUT Reservations
- [ ] WITH Reservations

Forward for Open Hearing:

Reviewed (Date) 10-20-97

School Committee Chair

**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: 11-12-97
Approved by Curriculum Committee Date: 11-14-97

Returned to Sponsor(s) for the following reason:

**Step #6 (Senate):**

Date announced/voted on at Senate: 11-13-97
If voted on: [✓] Approved
[ ] NOT Approved

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

Senate Curriculum Committee chair Signature/Date: ____________________________

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Step #7 (Executive Vice President/Provost): Date Received: 1/99

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

Registrar

Date Approved Course Description Received: 1/8

Regis Taxonomy and Course Number Assigned: 3/1/98

Date/Signature of Registrar: B.K. (w)

Notification Forward:

Senate Curriculum Committee Chairperson

Department Chairpersons

Academic Dean(s)

Registrar

Sponsor(s)

Transmittal

1/23/98
Course Proposal

1. Details:

a) Course Title: Chemical Process Component Design (0906.314)
b) Sponsor: Dr. C. Stewart Slater, and Chemical Engineering Curric. Com. (C. S. Slater, Z. Otero-Keil, R. P. Hesketh)
c) Credit Hours: 4 credit hours
d) Course Level: Junior
e) Curricular Effect: Requirement for Chemical Engineering students
f) Prerequisites: Transfer Processes I & II, Fluid Mechanics I, Process Fluid Tansport
g) Suggested Time/ Scale of Implementation: Spring 1999 1 section
h) Resources: Faculty will be hired consistent with the College of Engineering multi-year budget. No computer software beyond what is currently being acquired for approved course will be necessary. Laboratory equipment will be obtained consistent with the College of Engineering capital budget. Library acquisitions will be required consistent 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 introduce students to chemical process design. Students will investigate the process design parameters of transport processes: momentum, heat and mass transfer. This course will be the transition from the principles taught in the 2 s.h. lecture courses, i.e. Transfer Processes I & II to the Plant Design course taught in the senior year.

3. Essence of the Course:

a) Objectives:

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

1. Solve open-ended problems in the economic design of chemical process components used in the synthesis of chemical processes.
2. Understand the principles of “quick-sizing” and scale-up as related to process
component design.
3. Design parameters of momentum, heat and mass transfer processes as related to the overall plant synthesis.
4. Design parameters of batch and continuous flow reactor systems related to overall plant synthesis.
5. Design parameters of chemical equilibria systems related to overall plant synthesis.
6. Apply the economic aspects of engineering including evaluating alternative courses of action, depreciation, replacement analysis, and process optimization.
7. Use computer software (from CACHE and other sources) to analyze and design momentum, heat and mass transfer processes.
8. Understand the impact of safety and environmental issues on process component design.
9. Work in teams 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 to process component design

Vessels – design and cost
   Basic design features
   Size, hold-up time, materials of construction
   Baffling, packing, etc.
   Vessel costs

Heat exchangers and furnaces – design and costs
   Review of basic concepts – individual and overall coefficients
   Considerations in selection of equipment
   Operating concerns – layouts, fouling, etc.
   Heat transfer equipment costs
   Optimum design of heat exchangers and networks

Mass Transfer equipment – design and cost
   Finite-stage contactors
   Bubble-cap, sieve tray, valve tray
   Factors influencing plate and column efficiencies
   Continuous contactors
   Correlations of design parameters
   Mass transfer equipment cost

Chemical Thermodynamics - design and cost
Advanced design topics
Dryers and evaporators

Reactors - design and cost
   Equations for reactor-design application
   Mechanical features of design
   Estimation of costs for reactor equipment components

Safety and environmental considerations in process design
   Flammability of liquids and vapors
   Hazards identification
   Process hazards survey
   Hazard and operability studies (HAZOP)
   Safety reviews

c) Evaluation and Grading Procedure of Students:

Student grades will be based on examinations, homework and projects. A course syllabus
with a stated method of arriving at 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:

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

Chemical Process Component Design (0906.314)
Prerequisite:  Transfer Processes I & II, Process Fluid Transport, Co-requisite: Chemical Engineering Thermodynamics, Chemical Reaction Engineering

This course addresses the problems in economic design of chemical process components used in the synthesis of overall chemical processes. Economic aspects of engineering, including evaluating alternative course of action, cost factors, and process optimization are presented. Safety and environmental considerations in process selection will be discussed.