PROPOSAL NUMBER: 99- 1440 (12)

CURRICULUM PROPOSAL FORM

*DEADLINES:
ULAR COURSE PROPOSALS: OCTOBER 23, 1998 FOR FALL, 1999 AND FEBRUARY 19, 1999 FOR SPRING, 2000
SHORT-TERM COURSE PROPOSALS: DECEMBER 11, 1998 FOR FALL, 1999 AND MARCH 26, 1998 FOR SPRING 2000

PROPOSAL TITLE: Separation Processes - Change Topics, & Catalog Description

SPONSOR/S: C. Stewart Slater and ChEM. Eng. Curriculum Comm.

DEPARTMENT: Chemical Engineering 0906.314

CHECK ALL THAT APPLY:

X UNDERGRADUATE _____ GRADUATE

COLLEGE: ENGINEERING

If LAS:
_____ History/Humanities
_____ Math/Sciences
_____ Social/Behavioral Sciences

* * * * * * * * * * *

TYPE OF PROPOSAL *(Check ALL that Apply)*

___ General Education
___ *New Course in _____ Bank*
___ *Existing course, Add To _____ Bank*
___ *Multicultural/Global Designation*
___ *Writing Intensive Designation*

_____ New Minor/Concentration/Specialization
_____ New Major/Degree Program
_____ Short Term Course Proposal

_____ New Course (NOT Gen. Ed.)
_____ Name Change (Dept., School, Major)
_____ Changes in Degree Requirements
___ *Changes Involve Gen. Ed. requirements*

X Minor Changes to Existing Courses
X *Course is NOT General Education*
___ *Course IS General Education*

DEPARTMENT
(SIGNATURE INDICATES APPROVAL)

Robert P. Hesketh 10/23/98
DEPT. CURRICULUM CHAIR / DATE

10/23/98
DEPT. CHAIRPERSON / DATE

COLLEGE CURRICULUM COMMITTEE
DATE OF OPEN HEARING (if necessary) 2/9/99

X APPROVED

— NOT APPROVED
COMMENTS:

Robert P. Hesketh 2/9/99
SIGNATURE DATE

ACADEMIC DEAN (& GRADUATE DEAN, for New Graduate Programs Only)

✓ APPROVED

— NOT APPROVED
COMMENTS:

10/23/98
SIGNATURE (Academic Dean) DATE

SIGNATURE (Graduate Dean) DATE

UNIVERSITY CURRICULUM COMMITTEE

DATE OF OPEN HEARING (if necessary) 2/9/99 (College level only)

✓ APPROVED

— NOT APPROVED

COMMENTS:

Loretta M. Reese 2/19/99

SIGNATURE **DATE**

SENATE

Date announced at Senate 2/23/99

Voted upon at Senate: **Approved** **Not Approved** **Date:**

EXECUTIVE VICE PRESIDENT/PROVOST

_____ **APPROVED**

_____ **NOT APPROVED If no, reasons are as follows:**

STUDENT CREDIT HOURS _____ **FACULTY LOAD HOURS** _____ **EQUALIZED CREDIT HOURS** _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE): ____

DATE/SIGNATURE EXECUTIVE VICE PRESIDENT/PROVOST

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED _____

HEGIS TAXONOMY & COURSE NUMBER ASSIGNED Updated prerequisites

DATE/SIGNATURE OF REGISTRAR Robert A. Dubat 3/3/99

NOTIFICATION FORWARD:

✓ **SENATE CURRICULUM COMMITTEE CHAIRPERSON**

✓ **DEPARTMENT CHAIRPERSONS**

TTD 3/31/99

✓ **ACADEMIC DEAN(S)**

✓ **REGISTRAR**

SPONSOR(S)

Minor Change

1. Details:

a) Change: Change the Course Topics and Catalog Description of Separation Processes - 0906-314

Current Topics

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

Current Catalog Description

Separation Processes (0906.314)

(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.

New Topics

Principles of Mass Transfer
- Molecular diffusion in gases, liquids, solids
- Diffusion coefficients for gases, liquid, solids

Introduction to unsteady state mass transfer

Convective mass transfer coefficients
- Types of mass transfer coefficients
- Methods to determine mass transfer coefficients

Mass transfer coefficients for various geometries
- Derivations of mass transfer coefficients for laminar flow
- Mass transfer relations for flow inside pipes
- Mass transfer relations for flow outside solid surfaces

Diffusion of gases in porous solids and capillaries
- Knudsen and molecular diffusion of gases

Introduction to sporption processes
- Adsorption, chromatography and ion exchange

Sorption in packed beds
- Adsorbents and packing structure
- Adsorption equilibrium
- Solute movement theories
- Effects of thermodynamic variables

Linear theories of sorption and chromatography
- Types of chromatography
- Solute movement theories
- Large-scale chromatography

Non-linear theories of packed bed adsorption systems
- Mass transfer zone approach
- Constant pattern solutions
- Mass transfer correlations

Adsorption-desorption operations
- Thermal desorption of gases
- Activated carbon solvent recovery systems
- Pressure swing and vacuum swing adsorption
- Regeneration with purge and desorbent

Ion exchange
- Basics of ion exchange

- Ion exchange resins
- Ion exchange equilibrium
- Ion movement theory
- Commercial applications

Membrane processes
- Review of membrane separations
- Membrane materials and process configurations

Reverse osmosis
- Mass transfer analysis
- Design parameters
- Applications

Ultrafiltration and microfiltration
- Mass transfer analysis
- Design parameters
- Applications

Gas Permeation
- Mass transfer analysis
- Design parameters
- Applications

Introduction to other separation methods

2. Rationale:

The proposed change is consistent with the on-going assessment and review of the College of Engineering's programs of study. The Chemical Engineering program is making some minor changes with courses in response to information obtained from the American Society of Engineering Education and the American Institute of Chemical Engineers.

3. Results of Consultations:

This change will not impact any other engineering program or science program.

New Catalog Description

Separation Processes (0906.314)

(Prerequisites: Principles of Chemical Processes II (0906-302), Process Fluid Transport (0906-309), Transfer Processes II (0906-312), Math for Engineering Analysis II (1701-335), Physical Chemistry I (1908-400).

This course describes modes of diffusion of mass and chemical composition. This course includes mass transfer analysis; molecular diffusion in gases, liquids and solids and convective mass transfer. The course presents several rate-controlled separation processes and their relevant theory, design and applications. These processes include sorption processes of adsorption, chromatography and ion exchange; and membrane processes of reverse osmosis, ultra/microfiltration and gas permeation. Demonstrations and laboratories will be integrated throughout the course.