

ROWAN COLLEGE CURRICULUM COMMITTEE

PROPOSAL TITLE: PROCESS DYNAMICS AND CONTROL 0906-405

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 SIGNATURES.

STEP #4 (ACADEMIC DEAN) COMMENTS: RECOMMEND NOT RECOMMEND CONDITIONALLY RECOMMEND (SEE COMMENTS) DATE & SIGNATURE, DEAN OF SCHOOL J. Stacey 2/16/96

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

STEP #6 (SENATE) DATE PRESENTED TO SENATE 9/25/96 APPROVED NOT APPROVED NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE) 9/30/96 SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED 12/30

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 0906-405

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:** Process Dynamics and Control
b) Sponsor: School of Engineering Curriculum Committee
 Dr. C. Stewart Slater, Chemical Engineering
c) Credit Hours: 3 credit hours
d) Course Level: Senior (0906.405)
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 and laboratory equipment obtained 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 course builds on course topics in analyzing various aspects of modelling and control systems as applied to heat transfer, fluid transport, reactions and separations.

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

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

1. Apply the basic principles of process control to various chemical processes.
2. Dynamically model a chemical process.
3. Apply the feedback control strategies to individual unit processes and overall system designs including heat exchangers, pumps, reactors, separators, etc.

4. Enhance single-loop PID control using techniques such as cascade control and feed forward control as related to chemical processes.
5. Work in groups to solve open-ended process control design problems.
6. Understand the operational parameters of flow, level, pressure, temperature, pH control through hands-on experiments.
7. Use the latest computer software, e.g., PICLES, for process control.

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 control

Control objectives and benefits for the CPI
(Chemical Process Industry)

Process dynamics

Mathematical modelling principles
Modelling analysis for process control
Dynamic behavior of process systems
Empirical model identification

Feedback control

Feedback loop
PID (Proportional-Integral-Derivative) Algorithm
PID controller tuning for dynamic performance
Stability analysis and controller tuning
Digital implementation of process control
Practical applications of feedback control
Performance of feedback control systems

Enhancements to single-loop PID control

Cascade control
Feedforward control
Special topics

Process control design

Special case studies in the processing industries

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

Process Dynamics and Control (0906.405)

(Prerequisites: Separation Processes and Chemical Reaction Engineering)

This course provides an introduction to the dynamics, modelling and control of process systems. Topics studied will include: modelling analysis and application to control systems, dynamic behavior of processes, control objectives and benefits. Various aspects of feedback control will be emphasized: feedback loop, PID algorithm, tuning, performance, and applications. Enhancements to single-loop PID control; cascade control, and feedforward control will be discussed along with special topics. Process control design case studies will be included.



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