

1999 FEB 11 11 11

FEB 11 11 11

PROPOSAL SCC #99/00-431

CURRICULUM PROPOSAL FORM 1999-2000

ROWAN UNIVERSITY SENATE

NON-GENERAL EDUCATION PROCESS A

*DEADLINES: Deadline dates for 1999/2000 submissions: Regular proposals: October 22, 1999 to be implemented in Fall 2000; Short-Term proposals: December 10, 1999 to be implemented in Fall, 2000; Regular proposals February 18, 2000 to be implemented in Spring 2001; March 24, 2000 for short-term courses to be implemented in Spring 2001

Advanced

PROPOSAL TITLE: Engineering Process Analysis and Experimental Design

SPONSOR(S): Dr. Zenaida Otero Keil and the Chemical Engineering Curriculum Committee

DEPARTMENT: Chemical Engineering

COLLGE: Engineering

IF LAS CHECK ONE: History/Humanities Math/Science Social/Behavioral Sciences

Check one: Undergraduate Graduate

THE ATTACHED **NON-GEN-ED** PROPOSAL IS BEST DESCRIBED BY THE ITEM(S) CHECKED.

New non-gen-ed course

Short-term non-gen-ed course

Minor curricular changes (fewer than three) to:

- existing non-gen-ed course
- non-gen-ed degree requirements
- major
- minor, specialization, concentration, track certificate program

DEPARTMENT

(Signature indicates approval)

[Signature] *Rita Book Binder* *02/24/00*

Dept. Curriculum Chair/Date

Dept. Chairperson/Date

ACADEMIC DEAN

Approved Not Approved Comments:

Dean's Signature/Date *JH Dady* *2/24/00*

COLLEGE CURRICULUM COMMITTEE
 Date of open hearing (if necessary) 2/25/01 Approved Not Approved
 Comments:
 Signature of College Chair/Date: [Signature] 2/25/01

UNIVERSITY CURRICULUM COMMITTEE
 Date Received/Processed 4/11/01
 Comments:
 Curriculum Chair Signature: [Signature] Date Announced At Senate 5-8-01

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): _____ Executive VP/Provost Signature/Date 5/15/01
[Signature]

REGISTRAR
 Date Approved Course Description Required 5/23/01
 Hegis Taxonomy & Course Number Assigned _____
 Registrar Signature/Date [Signature]

NOTIFICATION FORWARD
 _____ Senate Curriculum Committee Chairperson _____ Academic Dean(s)
 _____ Department Chairpersons _____ Registrar _____ Sponsor(s)

Course Proposal

1. Details:

- | | |
|--|---|
| a) Course Title: | Advanced Engineering Process Analysis and Experimental Design (0906. 577) |
| b) Sponsor: | Dr. Zenaida Otero Keil and
Chemical Engineering Curriculum Committee |
| c) Credit Hours: | 3 credit hours |
| d) Course Level: | Graduate |
| e) Curricular Effect: | Technical elective for engineering graduate courses |
| f) Prerequisites: | Graduate standing and approval of Graduate Advisor |
| g) Suggested Time/
Scale of Implementation: | Spring 2001,
1 section |
| h) Resources: | Faculty will be hired consistent with the College of Engineering multi-year budget. Computer software required is available or will be acquired with approval of the College of Engineering Computer Committee. Laboratory equipment purchases will be consistent with the College of Engineering capital budget. Required library acquisitions will be consistent with current acquisition plan. |

2. Rationale:

The rising cost of experimentation and the increases in level of regulation and quality control have made process analysis and experimental design an important tool in engineering applications. The number of companies requiring that engineers have a strong background in process analysis and experimental design has drastically increased in the last decade. Continuous improvement and quality control strategies, now commonplace in engineering industries, also require a strong foundation in process analysis and experimental design. The proposed course is the graduate companion to the Fundamentals in Engineering Process Analysis and Experimental Design (0906.477) that was approved last year.

The course will address multidisciplinary topics in process analysis and experimental design that are relevant to many areas of engineering and science. The course will describe the basic principles of process and data analysis and experimental design applications. This will include applications in a wide range of industries such as pharmaceuticals, foods, bulk chemicals and petroleum.

3. *Essence of the Course:*

a) Objectives:

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

1. Build on the fundamentals of process analysis and experimental design and understand and apply advanced process analysis and experimental design principles
2. Apply process and data analysis and experimental design techniques to a wide range of complex and industrially relevant engineering problems
3. Design an engineering process including proposed experimentation using advanced principles of process analysis and experimental design
4. Use complex process and data analysis and experimental design computer software.
5. 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.

- I. Introduction and Motivation
 1. Statistical Concepts in Process Analysis and Experimental Design
 2. Typical Applications of Process and Data Analysis
 3. Typical Applications of Experimental Design
 4. Historical Overview of Process Analysis and Experimental Design in Engineering
 5. Evolution of Quality in Process Analysis and Experimental Design
- II. Advanced Process Data Characterization Methods
 1. Sampling in Processes
 2. Characterization and Representation of Data
 3. Probability Analysis for Processes

- III. Process Data Analysis Methods
 - 1. Simple Comparative Analysis
 - 2. Process Precision Analysis
 - 3. Process Variable Analysis
 - 4. Process Applications of Analysis of Variance
 - 5. Advanced Regression Models
 - 6. Meta-Analysis

- IV. Experimental Design
 - 1. Statistical Framework for Design
 - 2. Randomized Blocks, Latin Squares and Related Designs
 - 3. Factorial Designs
 - 4. Nested and Split-Plot Designs
 - 5. Response Surface Models for Process Optimization
 - 6. Mixtures and Constrained Designs

- V. Process Charting for Optimization
 - 1. Statistical Basis for Charting
 - 2. Construction and Interpretation of Charts
 - 3. Process Capability Assessment

c) Evaluation and Grading Procedure of Students:

Student grades will be based on examinations, homework and a required semester project. A course syllabus with a stated method of arriving to the final grade, e.g., number of exams, projects, homework, percentage of grade, will be distributed to students the first week of classes. Graduate students will be expected to take a leadership position in team-oriented projects that include undergraduates.

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:

Consultations via e-mail with the Department of Mathematics resulted in suggestions to strengthen this proposal. Input from the Department of Mathematics was included in the proposal.

Catalog Description

Process Analysis and Experimental Design (0906. 577)

Prerequisite: Graduate standing and approval of Graduate Advisor

This course exposes students to advanced engineering applications of process analysis and experimental design. The course includes a multidisciplinary approach with theoretical background to support the course applications. Students will use advanced statistical and optimization techniques for process analysis and experimental design, process monitoring and quality control presently used in industry. The analysis and experimental design techniques presented in this course serve to optimize complex industrially relevant processes and make engineering design and calculations more effective. Applications from a wide range of industries will be presented including pharmaceutical, food, bulk and specialty chemicals, and petroleum industry applications.

My documents/courses/edesgradpro.doc