KOWAN COLLEGE
CURRICULUM COMMITTEE

PROPOSAL TITLE: Polymer Processing 0906:466

X UNDERGRADUATE ___ GRADUATE 3 CREDIT HOURS

SPONSOR(S): C. Stewart Slater

DEPARTMENT & TELEPHONE# Chemical Engineering

CHECK ONE: X COURSE ___ MINOR PROGRAM ___ CONCENTRATION ___ SPECIALIZATION

___ ACHIEVEMENT CERTIFICATE ___ CERTIFICATION PROGRAM ___ MAJOR PROGRAM

STEP #1 (DEPARTMENT)

X APPROVED/DATE: 3-27-97

___ NOT APPROVED/DATE:

DEPT. CURRICULUM CHR.

X REVIEWED/DATE: 3-27-97

DEPT. CHR.

STEP #2 (RECEIPT)

SCC# 9798-1

DATE RECEIVED: 6/97

SENATE CURRICULUM CHR.

STEP #3 (SCHOOL)

REVIEWED DATE: 3-28-97

X RECOMMEND TO APPROVE

___ RECOMMEND NOT TO APPROVE

FORWARD FOR OPEN HEARING

X WITHOUT RESERVATIONS

___ WITH RESERVATIONS

COMMENTS:

TRC TRC RAD JLS

CSS

SCHOOL COMMITTEE CHR.

STEP #4 (ACADEMIC DEAN)

X RECOMMEND

___ NOT RECOMMEND

___ CONDITIONALLY RECOMMEND (SEE COMMENTS)

DATE & SIGNATURE, DEAN OF SCHOOL

COMMENTS:

STEP #5 (SENATE CURRICULUM COMMITTEE)

DATE OF OPEN HEARING 10-9-97

APPROVED BY SENATE CURRICULUM COMMITTEE (DATE) 10-9-97

___ RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS:

STEP #6 (SENATE)

DATE PRESENTED TO SENATE 10-21-97 ✓ APPROVED ___ NOT APPROVED

NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE) 10-23-97

SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE Lauretta Reeves

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED _____

APPROVED: ___YES ___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 C. Hutton

REGISTRAR

D/ APPROVED COURSE DESCRIPTION RECEIVED 8 Jan 98

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 0906.466

DATE/SIGNATURE OF REGISTRAR B Z Kitsing

NOTIFICATION FORWARD:

___SENATE CURRICULUM COMMITTEE CHAIRPERSON

___DEPARTMENT CHAIRPERSON(S)

___ACADEMIC DEAN(S)

___REGISTRAR

___SPONSOR(S)

Transmitted 1/23/98

S-6 DISK CURRICULUM
EGCRS_FRM (C)

\CURRIC5B.DOC\

Course Proposal

1. Details:

a) Course Title:	Polymer Processing C 426 : 466
b) Sponsor:	Dr. C. Stewart Slater, Chemical Engineering
c) Credit Hours:	3 credit hours
d) Course Level:	Senior
e) Curricular Effect:	Technical Elective for Chemical Engineering majors
f) Prerequisites:	Engrg. Materials, Reaction Engrg, Chem. Engrg. Thermo
g) Suggested Time/ Scale of Implementation:	Fall 1999 1 section
h) Resources:	Faculty will be hired and equipment obtained consistent with Engineering School multi-year budget. No computer software beyond what is planned for existing courses is required. Library acquisitions will be required consistent with current acquisition plans.

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 course will address the area of processing of advanced materials that are important to chemical engineering. The course will build on the fundamentals learned in the core Engineering Materials course and in the "advanced chemistry" courses like Organic Chemistry or Introduction to Polymer Science.

3. Essence of the Course:

a) Objectives:

The proposed course is a Chemical Engineering applications elective in 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 the program by the Accreditation Board for Engineering and Technology (ABET).

The course will provide advanced knowledge in the area of polymeric material processing: the relationship between their structure, properties and fabrication techniques. These will be analyzed with regard to applications in industry.

b) Topical Outline:

Upon completion of this course students will be able to:

1. Understand the basic engineering concepts of polymers systems beyond basic material science and advanced chemistry.

2. Analyze and mathematically model the kinetics/reaction engineering pathways of polymer reactions.

3. Describe polymer viscous flow behavior for Newtonian and non-Newtonian systems.

4. Evaluate and predict mechanical properties of polymers and deformation mechanics.

5. Evaluate fabrication processes of mixing and single and multi-dimensional processes such as coating, extrusion, molding, laminates.

6. Understand the manufacturing parameters related to the production of thin-films and membranes, e.g., stretching, template leaching, phase inversion, hollow fiber spinning.

7. Apply mathematical/computer routines (CACHE software) to design and simulate polymer production.

8. Understand the relationship between polymer function and manufacturing parameters in terms of industrial applications.

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
- Basic structure and types of polymers

Physical characteristics
- Physical states; amorphous and crystalline
- Plasticization and crystallization

Polymer formation and processes
- Polymerization reactions and kinetics
- Copolymerization and polymer modification
- Polymerization processes

Viscous flow

- Polymer shapes in solution and viscosity
- Process parameter effects

Mechanical properties at small deformations
- Viscoelasticity models and determination
- Effect of molecular weight, crystallinity and fillers

Properties of polymer systems
- Design goals in compounding
- Properties: hardness, density, thermal, electrical conductivity
- Failure and stress-strain tests
- Break energy, creep failure, fatigue
- Degradation and stabilization of polymer systems

Fabrication processes – process parameters and equipment
- Mixing
- One-dimensional processes
  - Coatings, adhesives
- Two-dimensional processes
  - Extrusion; film, sheet, tubing; fibers; laminates
- Three-dimensional processes
  - Molding, foams

Manufacturing processes for thin-films and membranes– process parameters and equipment
- Sintering
- Stretching
- Track-etching
- Template leaching
- Phase inversion
- Coating
- Special cases of hollow fiber spinning

Characterization of polymers

Application of mathematical/computer methods to polymer production
- Process design and simulation

Industrial applications
- Petroleum production/refining
- Bioengineering
- Medical/Pharmaceutical devices
- Food and beverage packaging
- Pollution prevention
- Occupational safety and health

Aerospace/Automobile design

c) Evaluation and Grading Procedure of Students:

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

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

Polymer Processing (0906.466)
(Prerequisites: Engrg. Materials, Reaction Engrg, Chem. Engrg. Thermo)

The course provides an introduction to the various aspects of polymer engineering starting with basic polymer properties, structure and function. The major topics covered are the formation of polymer systems and manufacturing techniques. Fabrication processes topics include coating, extrusion, and foams. The production of thin-films and membranes will focus on stretching, phase inversion, and hollow fiber spinning. Students will study application of polymeric materials engineering to various industries.

Rowan College *of* New Jersey
Glassboro, NJ 08028-1701 • 609/256-4855

Department of Chemistry and Physics

To: Curriculum Committee
From: Robert Newland, Chairperson
Subject: Chemical Engineering Technical Electives
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 and am convinced there are no additional resources required to meet this demand for our courses. We fully support these proposals.

Electrochemical Engineering
Environmental Regulations in Technology Industries
Environmental Considerations in Process Design
Process Safety
Membrane Process Technology
Advanced Separation Technology
Process Heat Transfer
Fluid Flow in Processing and Manufacturing
Advanced Reactor Design
Bioprocess Engineering
Transport Phenomena