

(2)

KOWAN COLLEGE
CURRICULUM COMMITTEE


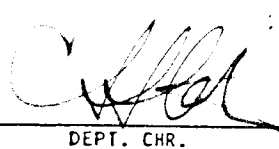
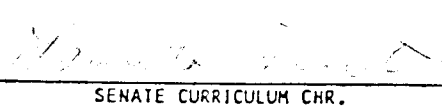
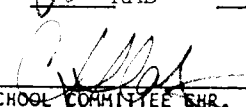
ROPOSAL TITLE: POLYMER ENGINEERING

 UNDERGRADUATE GRADUATE 3 CREDIT HOURS

PONSOR(S): C. Stewart Slater

DEPARTMENT & TELEPHONE# Chemical Engineering x4631

CHECK ONE: COURSE MINOR PROGRAM CONCENTRATION SPECIALIZATION
 ACHIEVEMENT CERTIFICATE CERTIFICATION PROGRAM MAJOR PROGRAM

STEP #1 (DEPARTMENT)	STEP #2 (RECEIPT)	STEP #3 (SCHOOL)
<input checked="" type="checkbox"/> APPROVED/DATE: <u>3-27-97</u> <u> </u> NOT APPROVED/DATE:  DEPT. CURRICULUM CHR. <input checked="" type="checkbox"/> REVIEWED/DATE: <u>3-27-97</u>  DEPT. CHR.	SCC# <u>9798-5</u> DATE RECEIVED: <u>6/97</u>  SENATE CURRICULUM CHR.	REVIEWED DATE: <u>3-20-97</u> <input checked="" type="checkbox"/> RECOMMEND TO APPROVE <u> </u> RECOMMEND NOT TO APPROVE FORWARD FOR OPEN HEARING <input checked="" type="checkbox"/> WITHOUT RESERVATIONS <u> </u> WITH RESERVATIONS COMMENTS: TRC <u> </u> TRC <u> </u> RAD <u> </u> JLS <u> </u> CSS <u> </u>  SCHOOL COMMITTEE CHR.

STEP #4 (ACADEMIC DEAN) COMMENTS:

RECOMMEND
 NOT RECOMMEND
 CONDITIONALLY RECOMMEND (SEE COMMENTS)
 DATE & SIGNATURE, DEAN OF SCHOOL J. Stacey

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 10-28-97 APPROVED NOT APPROVED

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

SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE Lucretia Reeves

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED _____

APPROVED: YES NO

IF , REASONS ARE AS FOLLOWS:

Spring 98

STUDENT CREDIT HOURS 3

FACULTY LOAD HOURS 3

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) _____

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST *[Signature]*

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 28 Oct. 97

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 0906-518

DATE/SIGNATURE OF REGISTRAR B. J. Keating

NOTIFICATION FORWARD:

SENATE CURRICULUM COMMITTEE CHAIRPERSON

DEPARTMENT CHAIRPERSON(S)

ACADEMIC DEAN(S)

REGISTRAR

SPONSOR(S)

Course Proposal

1. Details:

- a) **Course Title:** Polymer Engineering
b) **Sponsor:** School of Engineering Curriculum Committee
Dr. C. Stewart Slater, Chemical Engineering
c) **Credit Hours:** 3 credit hours
d) **Course Level:** Graduate
e) **Curricular Effect:** Technical Elective for Engineering graduate students
f) **Prerequisites:** Graduate Engineering standing and approval of Graduate Advisor
g) **Suggested Time/**
Scale of Implementation: Spring 1998
1 section
h) **Resources:** Faculty will be hired consistent with Engineering School multi-year budget.
Library acquisitions will be required and are consistent with current acquisition plan.
No software or laboratory equipment beyond those currently being used for other chemical engineering courses will be required.

2. Rationale:

The proposed course is a graduate elective in the School of Engineering and 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 advanced materials that are important to engineering students. The course will provide advanced knowledge in the area of polymeric material: their structure, properties and fabrication techniques. Of particular focus will be processing and manufacturing. These will be analyzed with regard to applications in industry with a term paper and presentation. The course will build on the fundamentals learned in the Engineering Materials course and advanced Chemistry/Science courses.

3. Essence of the Course:

a) Objectives:

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

Non-Newtonian polymers

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

Project reports and presentations regarding industrial applications

c) Evaluation and Grading Procedure of Students:

Student grades will be determined based on examinations, homework and project. 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 Engineering (0906.518)

(Prerequisites: Graduate Engineering standing and approval of advisor)

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

A handwritten signature in black ink, appearing to read 'RN', positioned to the right of the header information.

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