ROWAN COLLEGE
CURRICULUM COMMITTEE

PROPOSAL TITLE: Engineering Materials

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

STEP #1 (DEPARTMENT)

___ APPROVED/DATE:

___ NOT APPROVED/DATE: N/A

DEPT. CURRICULUM CHR.

___ REVIEWED/DATE:

N/A

DEPT. CHR.

STEP #2 (RECEIPT)

SCC# 95-96-66

DATE RECEIVED:

SENATE

RECEIVED

SENATE CURRICULUM CHR.

STEP #3 (SCHOOL)

REVIEWED DATE:- 10-4-95

X RECOMMEND TO APPROVE

___ RECOMMEND NOT TO APPROVE

FORWARD FOR OPEN HEARING

X WITHOUT RESERVATIONS

___ WITH RESERVATIONS

COMMENTS:

SCHOOL COMMITTEE CHR.

STEP #4 (ACADEMIC DEAN)

✓ RECOMMEND

___ NOT RECOMMEND

___ CONDITIONALLY RECOMMEND (SEE COMMENTS)

COMMENTS:

DATE & SIGNATURE, DEAN OF SCHOOL

STEP #5 (SENATE CURRICULUM COMMITTEE)

DATE OF OPEN HEARING 10/24/95

APPROVED BY SENATE CURRICULUM COMMITTEE (DATE) 10/31/95

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

STEP #6 (SENATE)

DATE PRESENTED TO SENATE 11/2/95 ___ APPROVED ___ NOT APPROVED

NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE)

SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED 12-4-95

APPROVED: ✓ YES ___NO

IF NO, REASONS ARE AS FOLLOWS:

STUDENT CREDIT HOURS 3

FACULTY LOAD HOURS 3

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) 12/8/95

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST [signature]

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 10 Jun 96

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 0906.212

DATE/SIGNATURE OF REGISTRAR [signature] 10 Jun 96

NOTIFICATION FORWARD:

___SENATE CURRICULUM COMMITTEE CHAIRPERSON

___DEPARTMENT CHAIRPERSON(S)

___ACADEMIC DEAN(S)

___REGISTRAR

___SPONSOR(S)

\CURRIC2C.WPD\

Course Proposal

1. Details:

a) Course Title:	Engineering Materials
b) Sponsor:	School of Engineering Curriculum Committee; Dr. C. Stewart Slater, Chemical Engineering
c) Credit Hours:	3 credit hours
d) Course Level:	Sophomore
e) Curricular Effect:	Engineering Core Requirement
f) Prerequisites:	Chemistry I, Physics II, Engineering Analysis I or equivalent
g) Suggested Time/ Scale of Implementation:	Spring 1998 1 section each semester
h) Resources:	Faculty to be hired and equipment obtained consistent with Engineering School multi-year plan. 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 proposed course is a Core Requirement for all engineering disciplines. The proposed course meets the Engineering Topics requirement of the Accreditation Board for Engineering and Technology (ABET) for engineering programs.

All engineering disciplines, chemical, civil, electrical, and mechanical are exposed to everyday problems related to engineering materials. This course will be multidisciplinary in nature. Material characteristics influence all aspects of engineering design, e.g., safety, environmental issues, performance, cost and reliability.

3. Essence of the Course:

a) Objectives:

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

1. Understand the importance of engineering materials to various technology areas;

2. Understand material characteristics, structure-property relationships and processing techniques for various engineering materials;

3. Apply fundamental materials concepts to the solution of various engineering 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.

Introduction
- Historical perspective on materials and civilization
- Structure <-> Properties <-> Performance relationship

Types of materials
- Metals, polymers, ceramics
- Conductors, semiconductors, insulators

Atomic bonding and coordination
- Atoms, ions, molecules, macromolecules
- Multidimensional bonding and interatomic distances

Crystalline structures
- Crystalline phases
- Cubic and noncubic structures
- Polymorphism
- Unit cell geometry
- Crystal directions and planes

Disorder in solid phases
- Imperfections in crystalline solids
- Noncrystalline materials
- Order and disorder in polymers
- Solid solutions in ceramic and metallic compounds

Phase equilibria
- Phase diagrams
- Quantitative analysis of equilibrated phases

Reaction rates
- Atomic diffusion

Microstructures
- Single phase materials
- Phase distributions - precipitates and eutectoid decompositions
- Microstructures and polymers

Deformation and fracture

- Elastic deformation
- Plastic deformation
- Deformation mechanisms
- Fracture

Shaping, Strengthening, and toughening processes
- Shaping processes
- Solution hardening
- Strain hardening and annealing
- Precipitation hardening
- Heat treatments and hardenability
- Special ceramic processes

Polymers and composites
- Deformation and flow of amorphous materials
- Processing of polymeric materials
- Properties of composites
- Wood

Conduction materials
- Charge carriers and metallic conductivity
- Intrinsic semiconductors
- Extrinsic semiconductors
- Semiconductor devices
- Semiconductor processing
- Superconductivity

Magnetic, dielectric and optical properties of materials
- Magnetic materials
  - Metallic magnets
  - Ceramic magnets
- Dielectric materials
  - Polymeric dielectrics
  - Ceramic dielectrics
- Transparent materials
- Light-emitting solids

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, 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.

Catalog Description

Chemical, mechanical, thermal, and electrical properties of engineering materials; relationship between atomic properties and macroscopic descriptions. Metals, ceramics, polymers, and composites; phase equilibria, deformation, yield, fracture, hardness, creep, fatigue; processing and its effects. Conductors, semiconductors, dielectrics, magnetic, and optical materials. Demonstrations integrated throughout the course.

Prerequisites:Chemistry I, Physics II, Engineering Analysis I or equivalent