ROWAN UNIVERSITY CURRICULUM PROPOSAL

1902-331 (2)

PROPOSAL TITLE: Electricity + Magnetism II

CHECK APPROPRIATE: X UNDERGRADUATE ___ GRADUATE ___ SEMESTER HOURS

SPONSOR(S): E. Flores, Dept Chem + Phys

DEPARTMENT/TELEPHONE # Chem + Phys - 4855

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

___ ACHIEVEMENT CERTIFICATE ___ CERTIFICATION PROGRAM ___ MAJOR PROGRAM

Step #1 (Department)

X Approved (Date) 9/12/97

___ Not Approved (Date)

R T Newland
Dept. Curriculum Chr.

9/12/97
Reviewed (Date)

R T Newland
Dept. Chr.

Step #2 (Receipt)

SCC# 97-98-29

10-9-97
Date Received Senate

Senate Curriculum Chr.

Step #3 (School)

Reviewed Date: 10/20/97

___ Recommend to Approved

___ Recommend NOT to Approve

Forward for Open Hearing:

X WITHOUT Reservations

___ WITH Reservations:

Comments:
Pre-req updated

Ken P Ragsdale
School Committee Chr.

Step #4 (Academic Dean): ✓ Recommended ___ NOT Recommended ___ Conditionally Recommended (See Comments)

Comments:

Dean Signature/Date

Step #5 (Senate Curriculum Committee): Open Hearing Date: 11-19-97 Approved by Curriculum Committee Date 11-19-97

Returned to Sponsor(s) for the following reason:

Step # 6 (Senate) Date announced/voted on at Senate 11-25-97 If voted on: ___ Approved ___ NOT Approved

...ıe forwarded to Executive Vice President/Provost 11/26/97

Senate Curriculum Committee chair Signature/Date: Anita Reeves 11/26/97

Step #7 (Executive Vice President/Provost): Date Received _____

___ Approved

___ NOT Approved If no, reasons are as follows:

Student Credit Hours 3

Faculty Load Hours 3

Equalized Credit Hours _____

Official Copy & Approval Sheet Filed (Date) _____

Executive Vice President/Provost Signature _____

Registrar

Date Approved Course Description Received 11/12/98

Hegis Taxonomy and Course Number Assigned _____

Date/Signature of Registrar Robert A. Kubat 11/25/98

Notification Forward:

✓ Senate Curriculum Committee Chairperson

✓ Department Chairpersons — Transmittal 1/11/99

✓ Academic Dean(s)

✓ Registrar

✓ Sponsor(s)

New Course

1. Details:

Title:	Electricity and Magnetism II
Sponsor:	Eduardo Flores and The Department of Chemistry and Physics
Credit Hours:	3
Course Level:	Undergraduate: Junior - Senior
Curricular Effect:	Major Elective
Prerequisites:	Electricity and Magnetism I or permission of instructor
Implementation:	Fall 98
Resources:	Present faculty is adequate, facilities, and library holdings are available.

2. Rationale:

Electricity and Magnetism is a fundamental subject in physics. Even though this theory was completed by Maxwell when he proposed the famous Maxwell's equations about 150 years ago it is still extremely important today. Most scientists regard a solid knowledge of electricity and magnetism as essential for students choosing a career in physics because it is important to every specialized area of physics. . This subject provided the theoretical background for the discovery and development of much of today technology: radio, television, electric light, electric motors, lasers, communication at the speed of light, etc.

The required curriculum is remarkably uniform from program to program not only on a national level, but on an international level as well. Students begin their study with introductory courses in Mechanics, Heat, Waves and Optics, Electricity and Magnetism, and Quantum Mechanics. They then take more advanced courses in these same five areas to complete the "core" of their program.

Electricity and Magnetism I, II are supposed to replace our present 4 credit Electricity & Magnetism course. Electricity and Magnetism is an extensive subject that is difficult to cover in one semester. Our main concern is that students do not have enough time to digest so much material in one semester. We have come to the conclusion that Electricity and Magnetism should be a two semester course. Most institutions teach Electricity and Magnetism in two semesters. We believe that if Electricity and Magnetism is divided into two semesters our students learn and retain more from this important fundamental course.

We plan to cover the fundamental concepts in Electricity and Magnetism I and to deal with extensions and applications of the fundamental concepts in Electricity and Magnetism II. Thus, it is possible to conceive that Electricity and Magnetism I should be a requirement and Electricity and Magnetism II an elective of particular interest to those students planning to go to graduate school in a science.

Electricity and Magnetism can be naturally divided in two parts. The study of static fields and charges, electrostatics, can be the major topic of Electricity and Magnetism I. Electrostatics can help students become familiar with the mathematical tools needed to derive Maxwell's equations. Maxwell's equations are the fundamental equations of Electricity and Magnetism. Electricity and Magnetism II should cover some consequences of Maxwell's equations such as the generation and propagation of electromagnetic waves, scattering, special relativity etc.

3. Essence of the Course:

Objectives:

After completing this course the student will be able to:

1. Understand the basics of the process of radiation with simple applications such as transmitters and receivers and antennas
2. Calculate basics interactions of light with matter
3. Understand the origin of special relativity from Maxwell's equations
4. Using the vector potential know how to to write electricity and magnetism in 4-dimensional space-time notation

Topics:

1. Electricity and Magnetism: potential formulation of electricity and magnetism, energy and momentum
2. Electromagnetic Waves: the wave equation, polarization, boundary conditions, waves in nonconductive media, waves in conductors, dispersion, plasmas, wave guides, the coaxial transmission line
3. Electromagnetic Radiation: dipole radiation, radiation from a point charge, radiation reaction
4. Electricity and Magnetism and Relativity: the special theory of relativity, relativistic mechanics, relativistic electricity and magnetism

Computer Simulation:

There are several software packages for simulation , such as "Radiation," that could be used in this course. "Radiation" is a computer program available to our students that allows them to visualize the process of electromagnetic radiation.

Possible Textbook:

David Griffiths, Introduction to Electrodynamics, second edition, 1989 (Prentice Hall, New Jersey)

Course Requirements:

Students are required to do weekly homework assignments, laboratory write ups, exams, and a final.

Evaluation:

1. Written Exams and Quizzes:
   Open book, closed book, "take-home"
2. Homework
   Weekly problem sets, papers, projects and other written reports
3. Class Participation
   Participation in class activities and/or class presentations
4. Course Evaluation:
   The departmental course evaluation form will be used at the end of the course

4. Consultation:
   Robert Newland, Department of Chemistry and Physics, Chair
   John L. Schmalzel, Electrical Engineering, Chair

5. Additional Information:
   none

6. Catalog Description

Prerequisite: Electricity and Magnetism I or permission of instructor

This course studies advanced applications of Maxwell's equations. For example, the generation of electromagnetic radiation and its propagation through matter will be discussed. The connection between Maxwell's equations and the special theory of relativity will be emphasized.