

ROWAN UNIVERSITY CURRICULUM PROPOSAL

1962-528 2

PROPOSAL TITLE:
Electricity Magnetism I (graduate)

CHECK APPROPRIATE: UNDERGRADUATE GRADUATE SEMESTER HOURS

SPONSOR(S):
6 Flores + Dept of Chem + Phys

DEPARTMENT/TELEPHONE # Chem + Phys, - 4855

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>9/12/97</u> <input type="checkbox"/> Not Approved (Date) <u>R J Howland (Chair)</u> Dept. Curriculum Chr. <u>9/12/97</u> Reviewed (Date) <u>R J Howland (Chair)</u> Dept. Chr.	Step #2 (Receipt) SCC# <u>97-98-39</u> <u>10/9/97</u> Date Received Senate <u>[Signature]</u> Senate Curriculum Chr.	Step #3 (School) Reviewed Date: <u>10/20/97</u> <input type="checkbox"/> Recommend to Approved <input type="checkbox"/> Recommend NOT to Approve Forward for Open Hearing: <input checked="" type="checkbox"/> WITHOUT Reservations <input type="checkbox"/> WITH Reservations: Comments: <u>Pre-req updated, lab/project specified</u> <u>Kan M-Sun</u> School Committee Chr.

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

Comments:

Dean Signature/Date: [Signature]

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

Be forwarded to Executive Vice President/Provost 11/20/97

Senate Curriculum Committee chair Signature/Date: [Signature] 11/11/98

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 [Signature]

Registrar

Date Approved Course Description Received 11/10/99

Hegis Taxonomy and Course Number Assigned _____

Date/Signature of Registrar Robert A. Kulat 11/25/99

Notification Forward:

Senate Curriculum Committee Chairperson

Department Chairpersons

Academic Dean(s)

Registrar

Sponsor(s)

Transmittal 1/11/99

New Course

1. Details:

Title:	Electricity and Magnetism I
Sponsor:	Eduardo Flores and The Department of Chemistry and Physics
Credit Hours:	3
Course Level:	Graduate
Curricular Effect:	Elective
Prerequisites:	Physics II (1902.201), Mathematical Physics (1902.325) or Mathematical Methods (1902.525), or permission of instructor
Implementation:	Fall 98
Resources:	Present faculty is adequate, facilities, and library holdings are available.

2. Rationale:

Electrodynamics 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's technology: radio, television, electric lights, 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. Electrodynamics 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 this subject in two semesters. We believe that if Electricity and Magnetism is divided into two semesters our students will learn and retain more from this important fundamental course.

We plan to cover the fundamental concepts of Electricity and Magnetism in Electricity and Magnetism I and to deal with extensions and applications of

these 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.

Electrodynamics 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. Explain the connection between each of Maxwell's equations and corresponding physical facts
2. Derive Maxwell's equations in differential or integral form
3. Provide a conceptual explanation of electromagnetic waves
4. Be familiar with vector analysis applications to Electricity and Magnetism

Topics:

2. Electrostatics: electrostatic field, divergence and curl of electrostatic fields, electric potential, work and energy, conductors
1. Vector Analysis: vector algebra, differential calculus, integral calculus, curvilinear coordinates, Dirac delta function
3. Special Techniques for Calculating Potentials: Laplace equations, method of Images, separation of variables, multipole expansion
4. Electrostatic Fields in Matter: polarization, field of a polarized object, electric displacement, linear dielectrics
5. Magnetostatics: the Lorentz force, Biot-Savart law, divergence and curl of B, magnetic vector potential
6. Magnetostatic Fields in Matter: magnetization, field of a magnetized object, the H field, linear and non-linear media
7. Electrodynamics: electromotive force, Faraday's law, Maxwell's equations

Possible Textbook:

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

Course Requirements:

1. Students are required to do weekly homework assignments, laboratory write

- ups, exams, and a final.
2. A graduate research paper or a laboratory project.

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. A graduate research paper or a laboratory project.

5. 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

6. Catalog Description *1902.528*

Prerequisites: Physics II (1902.201), Mathematical Physics (1902.325) or
Mathematical Methods (1902.525), or permission of instructor

This course studies static fields and charges and the application of vector calculus to Electricity and Magnetism. Maxwell's equations are derived from basic electrostatic phenomena. Some of the immediate consequences of Maxwell's equations such as electromagnetic waves will also be covered. The requirements of this course include a graduate research paper or a laboratory project. Admission to the course will be at the discretion of the Graduate Advisor