

ROWAN UNIVERSITY CURRICULUM PROPOSAL

PROPOSAL TITLE: ENGINEERING ELECTROMAGNETICS I

CHECK APPROPRIATE: UNDERGRADUATE GRADUATE SEMESTER HOURS 2

SPONSOR(S): DR. SURESHKANTH MANDAYAM & DR. JOHN L. SCHWALZEL

DEPARTMENT/TELEPHONE # ELECTRICAL ENGINEERING / 4-612

CHECK ONE: COURSE MINOR PROGRAM CONCENTRATION SPECIALIZATION

ACHIEVEMENT CERTIFICATE CERTIFICATION PROGRAM MAJOR PROGRAM

<p>Step #1 (Department)</p> <p><u>22 Oct 97</u> Approved (Date)</p> <p><input type="checkbox"/> Not Approved (Date)</p> <p style="text-align: center;"><u>John Seiff</u> Dept. Curriculum Chr.</p> <p style="text-align: center;"><u>22 Oct 97</u> Reviewed (Date)</p> <p style="text-align: center;"><u>John Seiff</u> Dept. Chr.</p>	<p>Step #2 (Receipt)</p> <p style="text-align: center;">SCC# <u>97-98-178</u></p> <p style="text-align: center;"><u>10-24-97</u> Date Received Senate</p> <p style="text-align: center;">_____ Senate Curriculum Chr.</p>	<p>Step #3 (School)</p> <p style="text-align: right;">Reviewed Date: <u>22 Oct 97</u></p> <p><input checked="" type="checkbox"/> Recommend to Approved</p> <p><input type="checkbox"/> Recommend NOT to Approve</p> <p>Forward for Open Hearing:</p> <p><input checked="" type="checkbox"/> WITHOUT Reservations</p> <p><input type="checkbox"/> WITH Reservations:</p> <p>Comments:</p> <p style="text-align: center;"><u>Robert P. Hesketh</u> School Committee Chr.</p>
--	---	--

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

Comments:

Dean Signature/Date: J. D. Barry 10/28/97

Step #5 (Senate Curriculum Committee): Open Hearing Date: _____ Approved by Curriculum Committee Date: _____

Returned to Sponsor(s) for the following reason:

Step #6 (Senate) Date announced/voted on at Senate 12/11/97 If voted on: Approved NOT Approved

Date forwarded to Executive Vice President/Provost 3/5/98

Senate Curriculum Committee chair Signature/Date: Arnette Reeves 3/4/98

#7 (Executive Vice President/Provost): Date Received MAR 5 1998

Approved

NOT Approved If no, reasons are as follows:

_____ent Credit Hours _____

_____ulty Load Hours _____

_____alized Credit Hours _____

_____cial Copy & Approval Sheet Filed (Date) 3/19/98

_____utive Vice President/Provost Signature (Signature)

Registrar

Approved Course Description Received 3/12/98

_____s Taxonomy and Course Number Assigned 0909-302

Signature of Registrar (Signature)

Notification Forward:

_____ Senate Curriculum Committee Chairperson

_____ Department Chairpersons

_____ Academic Dean(s)

_____ Registrar

_____ Sponsor(s)

Course Proposal

1. Details:

a) Course Title:	Engineering Electromagnetics II (0909.302)
b) Sponsor:	Dr. Shreekanth Mandayam and Dr. John L. Schmalzel, Electrical Engineering
c) Credit Hours:	2 credit hours
d) Course Level:	Junior
e) Curricular Effect:	Required course for electrical engineering majors
f) Prerequisites:	Engineering Electromagnetics I
g) Suggested Time/ Scale of Implementation	Fall 1998 One section
h) Resources	Faculty will be hired and laboratory equipment obtained consistent with Engineering School multi-year budget. Library acquisitions will be required.

2. Rationale:

The proposed course is a revision to part of the of the Engineering Curriculum Proposal approved by the College Senate in December, 1994, and 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 the Electrical Engineering discipline, contributing to the Engineering Topics requirements as defined by the Accreditation Board for Engineering and Technology (ABET).

Engineering electromagnetics lays the foundations for the analysis and design of the entire spectrum of electronic devices from the largest turboalternators to the smallest microcircuits. The theory of electromagnetic fields is required in the design and analysis of systems that incorporate very high signal frequencies and wireless signal transmission. Contemporary areas of application include satellite communications, remote sensing and electromagnetic interference and compatibility. Students gain familiarity with the development and application of the Maxwell's Equations for designing and analyzing systems based on electromagnetic wave propagation. Students also acquire competence with the use of mathematical models for these systems, which are comprised of hyperbolic partial differential equations.

3. Essence of the Course:

a) Objectives:

The proposed course has a number of objectives:

- (i) Provide review of the Maxwell's equations.
- (ii) Provide a working knowledge of principles electromagnetic wave propagation.
- (iii) Provide a knowledge of the mathematical tools (hyperbolic partial differential equations) for the analysis and design of devices based on electromagnetic wave propagation. These devices include Transmission lines, Antennas and Waveguides.
- (iv) Provide a working knowledge of the appropriate software for analyzing and designing devices based on electromagnetic wave propagation.
- (v) Demonstrate the applications of electromagnetic wave propagation in a variety of electronic systems — satellite communications, fiberoptic communications, microwave remote sensing, electromagnetic interference and compatibility.

b) Topical Outline:

The general topical outline is described below; however, prior to each semester's offering, the instructor will assess any technology advances in the course subject matter or in teaching resources prior to the course and make changes deemed appropriate to maintain requisite content and currency.

Review of Maxwell's Equations
Review of Maxwell's Equations for time-harmonic fields
Review of Poynting's theorem

Uniform plane waves
Electromagnetic sources
Polarization
Dissipative media
Radiation
Engineering applications

Reflection and transmission of waves
Boundary Conditions, Dielectric interfaces
Perfectly conducting planes
Engineering applications

Waveguides and resonators
Parallel-plate waveguides

Rectangular waveguides and resonators
Dielectric slab waveguides
Coaxial lines
Fiber-optic communications
Engineering applications

Transmission lines
Basic concepts and equations
Reflection coefficient and Smith Chart
Transients
Engineering applications

Antennas
Linear antennas
Array antennas
Engineering applications

c) Evaluation and Grading Procedures:

Student grades will be based on projects, examinations, homework, and written and oral technical communication.

d) Course Evaluation:

The proposed course will be evaluated based on student evaluations and critical review by engineering faculty.

4. Results of Consultations:

a) Consulted Departments: Physics

b) Consultants and Consultant Statements: (see attached)

c) Written Consultations: (see attached)

5. Additional Supporting Information:

Example textbooks that could serve as primary or supplemental references for this course:

1. L. C. Shen and J. A. Kong, *Applied Electromagnetism*, 3rd Edition, PWS Publishing, Boston, MA, 1995.
2. M. N. O. Sadiku, *Elements of Electromagnetics*, 2nd Edition, Oxford University Press, New York, NY, 1995.
3. D. K. Cheng, *Field and Wave Electromagnetics*, 2nd Edition, Addison-Wesley, Reading, MA, 1992.

Example software that could be used in conjunction with the course:

1. *Matlab Partial Differential Equation Toolbox*, The MathWorks Inc., Natick, MA.
2. *PC-Opera, Opera-2D*, Vector Fields, Inc., Aurora, IL.

6. Catalog Description:

The second course in engineering electromagnetics covering applications of electromagnetic wave propagation in contemporary electrical engineering practice. The course also covers numerical modeling of electromagnetic systems using appropriate software.

Prerequisite of Engineering Electromagnetics I required.