

PROPOSAL NUMBER: 99-435

CURRICULUM PROPOSAL FORM

***DEADLINES:**

REGULAR COURSE PROPOSALS: OCTOBER 23, 1998 FOR FALL, 1999 AND FEBRUARY 19, 1999 FOR SPRING, 2000
SHORT-TERM COURSE PROPOSALS: DECEMBER 11, 1998 FOR FALL, 1999 AND MARCH 26, 1998 FOR SPRING 2000

PROPOSAL TITLE: High Speed Interconnects (0909.401)

SPONSOR/S: R. Krchnavek, S. Mandayam, J. Schmalzel

DEPARTMENT: Electrical Engineering 0909.401

CHECK ALL THAT APPLY:
 UNDERGRADUATE GRADUATE

COLLEGE: _____
 If LAS: History/Humanities
 Math/Sciences
 Social/Behavioral Sciences

TYPE OF PROPOSAL (Check ALL that Apply)

<input type="checkbox"/> General Education	<input checked="" type="checkbox"/> New Course (NOT Gen. Ed.)
<input type="checkbox"/> New Course in _____ Bank	<input type="checkbox"/> Name Change (Dept., School, Major)
<input type="checkbox"/> Existing course, Add To _____ Bank	<input type="checkbox"/> Changes in Degree Requirements
<input type="checkbox"/> Multicultural/Global Designation	<input type="checkbox"/> Changes Involve Gen. Ed. requirements
<input type="checkbox"/> Writing Intensive Designation	<input type="checkbox"/> Minor Changes to Existing Courses
<input type="checkbox"/> New Minor/Concentration/Specialization	<input type="checkbox"/> Course is NOT General Education
<input type="checkbox"/> New Major/Degree Program	<input type="checkbox"/> Course IS General Education
<input type="checkbox"/> Short Term Course Proposal	

DEPARTMENT (SIGNATURE INDICATES APPROVAL)

Ravi R. Rameshchandra 10/23/98 John Saff

DEPT. CURRICULUM CHAIR / DATE DEPT. CHAIRPERSON / DATE

COLLEGE CURRICULUM COMMITTEE
 DATE OF OPEN HEARING (if necessary) _____

APPROVED
 NOT APPROVED

Comments:
 Robert P. Heskeith 11/5/98

SIGNATURE DATE

ACADEMIC DEAN (& GRADUATE DEAN, for New Graduate Programs Only)

APPROVED
 NOT APPROVED

Comments:
 [Signature] 10/23/98

SIGNATURE (Academic Dean) DATE
 SIGNATURE (Graduate Dean) DATE

UNIVERSITY CURRICULUM COMMITTEE

DATE OF OPEN HEARING (if necessary) None held
---- APPROVED

---- NOT APPROVED

Comments:

James R. ... 11/2/98

SIGNATURE DATE

SENATE

Date announced at Senate 12/1/98

Voted upon at Senate: _____ Approved _____ Not Approved _____ Date: _____

OFFICE OF THE

EXECUTIVE VICE PRESIDENT/PROVOST

___ APPROVED

___ NOT APPROVED If no, reasons are as follows:

DEC 1 1998

ROWAN UNIVERSITY

STUDENT CREDIT HOURS _____ FACULTY LOAD HOURS _____ EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE): _____

DATE/SIGNATURE EXECUTIVE VICE PRESIDENT/PROVOST [Signature]

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED _____

HEGIS TAXONOMY & COURSE NUMBER ASSIGNED 0909.461

DATE/SIGNATURE OF REGISTRAR Robert A. Kubit 12/1/98

NOTIFICATION FORWARD:

SENATE CURRICULUM COMMITTEE CHAIRPERSON

DEPARTMENT CHAIRPERSONS

ACADEMIC DEAN(S)

REGISTRAR

SPONSOR(S)

Transmittal 1/11/99

1. Details:

- a) Course Title: High-Speed Interconnects (0909.401)
- b) Sponsor: Dr. Robert R. Krchnavek, Dr. Shreekanth Mandayam, Dr. John L. Schmalzel and Electrical Engineering Curriculum Committee
- c) Credit Hours: 3 credit hours
- d) Course Level: Junior 2 or Senior
- e) Curricular Effect: Elective course for electrical engineering majors
- f) Prerequisites: ENG ELECTROMAG I (0909 301)
ENG ELECTROMAG II (0909 302)
- g) Suggested Time/
Scale of Implementation: Spring 1999
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 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.

From the smallest integrated circuit to the largest world-wide network, all electronic systems share one common theme – connectivity. On one end of the scale, today’s integrated circuits contain millions of transistors interconnected through multiple layers of metallization. On the other end, the World Wide Web links millions of computers throughout the world with a network of fiber optic and wireless high-speed links. The ever increasing clock speeds of computers and the growing thirst for instantaneous access to enormous quantities of data is forcing engineers to develop new techniques for high-speed interconnects.

All electronic/optical/wireless high-speed interconnects are electromagnetic phenomena that are governed by Maxwell’s equations. Students interested in a career that involves research and development of high

performance systems must possess a working knowledge of the wide variety of interconnect methods currently in use and expected in the near future. Experiments in the laboratory will complement and supplement the theory taught in class.

3. Essence of the Course:

a) Objectives:

The proposed course has a number of objectives:

- (i) Provide a detailed understanding of common high-speed interconnects including: transmission lines; metal waveguides; and dielectric waveguides.
- (ii) Provide a working knowledge of wireless interconnects primarily by developing an understanding of antennas.
- (iii) Provide a working knowledge of achieving electromagnetic compatibility (EMC) of high-speed electronic systems.
- (iv) Develop the ability to design/simulate high-speed interconnects using standard analytical and computer-based engineering aids and implement/test the designs in a laboratory setting

b) Topical Outline:

- Transmission Lines: coaxial, two-wire, stripline, microstrip; matched and unmatched; linear and nonlinear loads; transient response; impedance matching; time-domain reflectometry.
- Metal Waveguides: TE and TM waves in rectangular waveguides; power flow; attenuation; discontinuities; impedance.
- Dielectric Waveguides TE and TM waves in a dielectric slab waveguide; single-mode and multimode waveguides; dispersion; beam propagation methods.
- Antennas: elementary antenna theory; omnidirectional and directional antennas.

- Electromagnetic Compatibility: noise sources; cabling; grounding; shielding; digital circuit noise and radiation.

c) Evaluation and Grading Procedures:

Student grades will be based on projects, examinations, homework, laboratory reports 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.

e) Texts:

Field and Wave Electromagnetics, David K. Cheng, Addison-Wesley.

Electromagnetics: Concepts and Applications, S. V. Marshall, R. E. DuBroff, G. G. Skitek, Prentice Hall.

Noise Reduction Techniques in Electronic Systems, Henry W. Ott, Wiley-Interscience.

Grounding and Shielding Techniques in Instrumentation: Ralph Morrison, Wiley-Interscience.

4. Results of Consultations:

a) Consulted Departments: None

b) Consultants and Consultant Statements: N/A

c) Written Consultations: N/A

5. Additional Supporting Information: N/A

6. Catalog Description:

High Speed Interconnects (0909.401): 3 credits

High-speed interconnects are pervasive in electronic systems. From the smallest integrated circuits to the largest world-wide networks, the ability to interconnect components, subsystems and systems is of critical importance. This course will provide a fundamental understanding of the various techniques used to achieve high-speed interconnects. Topics to be covered include: transmission lines, metal waveguides, dielectric waveguides, antennas, and electromagnetic compatibility.

Prerequisite of Engineering Electromagnetics I (0909 301), Engineering Electromagnetics II (0909 302)