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PROPOSAL NUMBER: 99-433

### 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: Modern Solid State Devices (0909.411)

SPONSOR/S: L. Head, J. Schmalzel

DEPARTMENT: Electrical Engineering

0909.411

CHECK ALL THAT APPLY:

UNDERGRADUATE     GRADUATE

COLLEGE: \_\_\_\_\_

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

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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 Subh Ramachandran / 10/23/98      John Siff

DEPT. CURRICULUM CHAIR / DATE      DEPT. CHAIRPERSON / DATE

<p>COLLEGE CURRICULUM COMMITTEE</p> <p>DATE OF OPEN HEARING (if necessary) _____</p> <p><input checked="" type="checkbox"/> APPROVED</p> <p>----- NOT APPROVED</p> <p>Comments:</p> <p><u>Robert P. Huskath / 11/5/98</u></p> <p>SIGNATURE      DATE</p>	<p>ACADEMIC DEAN (&amp; GRADUATE DEAN, for New Graduate Programs Only)</p> <p><input checked="" type="checkbox"/> APPROVED</p> <p>----- NOT APPROVED</p> <p>Comments:</p> <p><u>J. Siff / 10/23/98</u></p> <p>SIGNATURE (Academic Dean)      DATE</p> <p>SIGNATURE (Graduate Dean)      DATE</p>
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UNIVERSITY CURRICULUM COMMITTEE

DATE OF OPEN HEARING (if necessary) 11/19/98

---- APPROVED  
---- NOT APPROVED

Comments:

Reserve Section 11/24/98

SIGNATURE DATE

SENATE

Date announced at Senate 11/19/98

Voted upon at Senate: \_\_\_\_\_ Approved \_\_\_\_\_ Not Approved \_\_\_\_\_ Date: \_\_\_\_\_

EXECUTIVE VICE PRESIDENT/PROVOST

\_\_\_\_ APPROVED  
\_\_\_\_ NOT APPROVED If no, reasons are as follows:

OFFICE OF THE PROVOST

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 109.411

DATE/SIGNATURE OF REGISTRAR Robert A. Kubit 12/10/98

NOTIFICATION FORWARD:

- SENATE CURRICULUM COMMITTEE CHAIRPERSON
- DEPARTMENT CHAIRPERSONS
- ACADEMIC DEAN(S)
- REGISTRAR
- SPONSOR(S)

Transmittal 1/11/99

**1. Details:**

- |   |  |
|---|--|
| a) Course Title:                              | Modern Solid State Devices (0909.411)  |
| b) Sponsor:                                   | Dr. Linda M. Head, Dr. John L. Schmalzel and Electrical Engineering curriculum committee   |
| c) Credit Hours:                              | 3 credit hours   |
| d) Course Level:                              | Junior 1, Junior 2 or Senior   |
| e) Curricular Effect:                         | Elective course for electrical engineering majors  |
| f) Prerequisites:                             | Electronics I 0909-211   |
| g) Suggested Time/<br>Scale of Implementation | Spring 1999<br>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.

This course will provide student with the opportunity to learn the physical fundamentals of semiconductor device operation. There are two goals that will be met in the content of this course. The first goal is to provide the student with a sound understanding of existing devices. The principles of Integrated Circuit (IC) design, fabrication and operation are based on the physical properties of semiconductor materials. A thorough understanding of these physical properties makes the study of electronic circuits and systems more meaningful for the student. The second goal is to develop the basic tools that the student will use to understand and analyze newly developed devices and applications. Meeting this goal requires that the student understand semiconductor materials and conduction processes in solids. By giving the student the tools to become a lifelong "self-educator" we invest in the future of the engineering profession.

**3. Essence of the Course:****a) Objectives:**

The proposed course has a number of objectives:

- (i) Introduce structures of solids and semiconductor fabrication techniques
- (ii) Provide an understanding of atomic structure, energy distributions and carrier processes in semiconductors
- (iii) Provide a thorough description including conduction processes of a p-n junction
- (iv) Develop an ability to analyze and model the dc and ac functioning of three terminal semiconductor devices
- (v) Introduce the fundamentals of laser operation

**b) Topical Outline:**

- Crystal properties and growth of semiconductors
- Physical models of solids
- Energy bands and charge carriers in semiconductors
- Excess carriers in semiconductors
- P-n junctions

- Bipolar junction transistors
- Field effect transistors
- Lasers

**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:**

D.A. Neamen, *Semiconductor Physics and Devices, Basic Principles*, Richard D. Irwin, Inc., Homewood, IL, 1992.

A.Bar-Lev, *Semiconductors and Electronic Devices*, Third Edition, Prentice-Hall, New York, 1993.

R.F. Pierret, *Semiconductor Device Fundamentals*, Addison-Wesley, Reading, MA, 1996.

B.G. Streetman, *Solid State Electronic Devices*, Prentice Hall, New Jersey, 1996.

K. Kano, *Semiconductor Devices*, Prentice Hall, New Jersey, 1998.

**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**

**Catalog Description:**

Modern Solid State Devices (0909.411): 3 credits

This is an introductory course in the fundamentals of solid state electronic devices. The course will cover the physical structure of silicon and compound semiconductor materials and the conduction processes in these materials. The p-n junction and its applications will be studied along with the principles of transistor devices. The course will address analog and switching applications and introduce basic laser operation.

Prerequisites of Physics I (1902 200), Networks I (0909 201), Electronics I (0909 311)