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PROPOSAL NUMBER: 99-1739

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: Digital Signal Processing (0909.351)

SPONSOR/S: R. Ramachandran, J. Schmalzel

DEPARTMENT: Electrical Engineering

0909.351

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 Sankh Ramachandran 10/23/98

DEPT. CURRICULUM CHAIR / DATE

John Sull

DEPT. CHAIRPERSON / DATE

<p>COLLEGE CURRICULUM COMMITTEE</p> <p>DATE OF OPEN HEARING (if necessary) <u>11/5/98</u></p> <p><input checked="" type="checkbox"/> APPROVED</p> <p><input type="checkbox"/> NOT APPROVED</p> <p>Comments:</p> <p><u>Robert P. Hebert</u> <u>11/5/98</u></p> <p>SIGNATURE DATE</p>	<p>ACADEMIC DEAN (& GRADUATE DEAN, for New Graduate Programs Only)</p> <p><input checked="" type="checkbox"/> APPROVED</p> <p><input type="checkbox"/> NOT APPROVED</p> <p>Comments:</p> <p><u>Tracy</u> <u>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) College level only
----- APPROVED

----- NOT APPROVED

Comments:

A. A. [Signature] 11/6/98
SIGNATURE DATE

SENATE

Date announced at Senate 11/6/98

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

EXECUTIVE VICE PRESIDENT/PROVOST

____ APPROVED

____ NOT APPROVED If no, reasons are as follows:

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

OFFICIAL COPY & APPROVAL SHEET FILED (DATE): _____

DATE/SIGNATURE EXECUTIVE VICE PRESIDENT/PROVOST [Signature] 11/9/98

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 11/9/98

HEGIS TAXONOMY & COURSE NUMBER ASSIGNED L909 351

DATE/SIGNATURE OF REGISTRAR Robert Ci. Kubat 11/9/98

NOTIFICATION FORWARD:

____ SENATE CURRICULUM COMMITTEE CHAIRPERSON

____ DEPARTMENT CHAIRPERSONS

____ ACADEMIC DEAN(S)

____ REGISTRAR

____ SPONSOR(S)

1. Details:

- a) Course Title: Digital Signal Processing (0909351)
- b) Sponsor: Dr. Ravi P. Ramachandran, Dr. John L. Schmalzel and Electrical Engineering Curriculum Committee
- c) Credit Hours: 3 credit hours
- d) Course Level: Junior 2
- e) Curricular Effect: Required course for electrical engineering majors
- f) Prerequisites: Systems and Control 1 (0909 321)
- 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.

The impact of digital information technology in the world market has been rather awesome. The word 'digital' has become a common word in today's marketplace. Examples include digital audio, digital television, digital video and digital communications. This course provides the fundamental framework to allow the student to further expand into one or more of these 'digital' areas by introducing the basic concepts of digital signal processing. A mathematical problem-solving perspective, software simulation perspective and a perspective into special purpose hardware are provided for.

3. Essence of the Course:

a) Objectives:

The proposed course has a number of objectives:

- (i) Provide an overview of the basic concepts of digital signal processing and signal theory.
- (ii) Provide an understanding of analog to digital and digital to analog conversion including sampling.
- (iii) Provide a working knowledge of the structures and design of digital filters.
- (iv) Provide an understanding of the discrete Fourier transform.
- (v) Develop the ability to simulate digital signal processing operations using C, MATLAB and on special purpose signal processing hardware chips.
- (vi) Provide an understanding of the basics of complex variables.

b) Topical Outline:

- Discrete time signals and systems: linearity; time-invariance; stability; causality; difference equation representation; impulse response; frequency response; convolution.
- Analog to digital and digital to analog conversion, quantization, sampling.
- Complex variables: Cauchy-Riemann equations, Cauchy's integral formula, residue theorem.
- The z-transform: properties; calculation of; inverse z-transform; relationship to convolution; analysis of digital systems.
- Structures and design of digital filters: signal flow graph; canonical, cascade and parallel structures; finite impulse response design methods; infinite impulse response design methods.
- Discrete Fourier Transform: properties; computation using Fast Fourier Transform methods; relationship to z-transform and frequency response.

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:

A. V. Oppenheim and R. W. Schaffer, *Discrete-Time Signal Processing*. Prentice-Hall: New Jersey, 1989.

S. Orfanidis, *Introduction to Signal Processing*. Prentice-Hall: New Jersey, 1995.

J. G. Proakis and D. G. Manolakis, *Introduction to Digital Signal Processing*, Macmillan Publishing Company, 1988.

J. H. McClellan, R. W. Schaffer and M. A. Yoder, *DSP First: A Multimedia Approach*. Prentice-Hall: New Jersey, 1998.

B. Porat, *A Course in Digital Signal Processing*. John Wiley and Sons, 1997.

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

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6. Catalog Description:

Digital Signal Processing (0909.351): 3 credits

This is a junior level undergraduate course that covers the fundamentals of digital signals, systems, transforms and filters. Systems concepts taught include linearity, time-invariance, stability, causality, difference equation representation, impulse response and convolution. The issues of frequency response, conversion between analog and digital signals and sampling are covered. The z-transform is introduced. Design methods and structures of digital filters are discussed. Complex variables are covered. The student is exposed to software and hardware designs.

Prerequisite: Systems and Control 1 (0909 321)