SENATE

OCT 27

RECEIVED

PROPOSAL SCC #99/00-407

CURRICULUM PROPOSAL FORM 1999-2000

NON-GENERAL EDUCATION PROCESS A

*DEADLINES: Deadline dates for 1999/2000 submissions: Regular proposals: October 22, 1999 to be implemented in Fall 2000; Short-Term proposals: December 10, 1999 to be implemented in Fall, 2000; Regular proposals February 18, 2000 to be implemented in Spring 2001; March 24, 2000 for short-term courses to be implemented in Spring 2001

0909.453

PROPOSAL TITLE: Adaptive Filters (0909.453)

SPONSOR(S): R. Ramachandran, J. Schmalzel

DEPARTMENT: Electrical and Computer Engineering

COLLEGE: Engineering

IF LAS CHECK ONE:_____History/Humanities _____Math/Science _____Social/Behavioral Sciences

Check one: __X__Undergraduate _____Graduate

THE ATTACHED *NON-GEN-ED* PROPOSAL IS BEST DESCRIBED BY THE ITEM(S) CHECKED.

__X__New non-gen-ed course
_____Short-term non-gen-ed course
_____Minor curricular changes (fewer than three) to:
  _____existing non-gen-ed course
  _____non-gen-ed degree requirements
  _____major
  _____minor, specialization, concentration, track certificate program

DEPARTMENT
(Signature indicates approval) Ravi Prakash Ramachandran 10/25/99

Dept. Curriculum Chair/Date John Schmalzel 25 OCT 1999

Dept. Chairperson/Date

ACADEMIC DEAN

Approved ✓ Not Approved_____ Comments:

Dean's Signature/Date [signature]

COLLEGE CURRICULUM COMMITTEE

Date of open hearing (if necessary) 12/8/99 Approved ✓ Not Approved_____

Comments:

Signature of College Chair/Date: Ravi Rabh Ramachandran

UNIVERSITY CURRICULUM COMMITTEE

Date Received/Processed 2/1/00

Comments:

Curriculum Chair Signature: ____________ Date Announced At Senate 2/1/00

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): ________ Executive VP/Proved Signature/Date ____ 2/1/00

REGISTRAR

Date Approved Course Description Required___________

Hegis Taxonomy & Course Number Assigned 0909.453

Registrar Signature/Date Robert A. Zeleznik 2/15/00

NOTIFICATION FORWARD

_____Senate Curriculum Committee Chairperson _____Academic Dean(s)

_____Department Chairpersons _____Registrar _____Sponsor(s)

Course Proposal

1. Details:

a) Course Title:	Adaptive Filters (0909.453)
b) Sponsor:	Dr. Ravi P. Ramachandran, Dr. John L. Schmalzel and Electrical Engineering Curriculum Committee
c) Credit Hours:	3 credit hours
d) Course Level:	Senior
e) Curricular Effect:	Elective course for electrical engineering majors
f) Prerequisites:	Digital Signal Processing (0909.351)
g) Suggested Time/ Scale of Implementation	Fall 2000 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 term adaptive filter refers to a device (hardware or software) that is applied to noisy data in order to extract information of interest. There are numerous applications of adaptive filters which are stressed in this course, namely, seismic signal modeling, blind deconvolution, communication channel equalization, radar, beamforming and noise cancellation. This course provides the fundamental framework to allow the student to design and implement adaptive filtering algorithms for applications in the above areas. A design perpsective using special purpose hardware asnd software is emphasized.

3. Essence of the Course:

a) Objectives:

The proposed course has a number of objectives:

(i) Provide an overview of the analysis of random signals.

(ii) Analysis and implementation of adaptive filtering algorithms using software and special purpose hardware.

(iii) Understand the application of adaptive filtering algorithms to communications, radar, seismic analysis, signal separation and noise cancellation.

b) Topical Outline:

- Principles of random signals: stationary processes, correlation, power spectral density, Weiner filtering, Kalman filtering.
- Adaptive Filtering Algorithms: Steepest Descent, Least-Mean-Squares (LMS), Recursive Least-Squares (RLS).
- Adaptive Filter Structures: Transversal, Lattice, FIR, IIR.
- Adaptive filter implementation: Study of quantization noise and finite wordlength effects.
- Applications to communications and signal analysis: channel equalization, signal separation, radar, noise cancellation.

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:

S. Haykin, *Adaptive Filter Theory*. Prentice-Hall: New Jersey, 1991.

P. S. R. Diniz, *Adaptive Filtering: Algorithms and Practical Implementation*. Kluwer Academic Publishers, 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

6. Catalog Description:

Adaptive Filters (0909.453)

This is a senior level undergraduate elective course that covers the fundamentals and implementation of adaptive filtering algorithms using software and special purpose hardware. Topics include random signals, least-mean squares method, recursive least squares method, filter structures and finite wordlength effects. The student is exposed to applications in communications, signal separation, radar, noise cancellation and seismic signal processing.

Prerequisite: Digital Signal Processing (0909.351)