Electrical Eng

PROPOSAL NUMBER: 99- 459

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: PRINCIPLES OF NONDESTRUCTIVE EVALUATION

SPONSOR/S: S MANDAYAM & ECE CURR. COMM.

DEPARTMENT: ENGINEERING C909. 413

CHECK ALL THAT APPLY:
__X__ UNDERGRADUATE _____ GRADUATE

COLLEGE: ENGINEERING

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

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TYPE OF PROPOSAL *(Check ALL that Apply)*

_____ General Education
___ *New Course in* _____ *Bank*
___ *Existing course, Add To* _____ *Bank*
___ *Multicultural/Global Designation*
___ *Writing Intensive Designation*

__X__ New Course (NOT Gen. Ed.)
_____ Name Change (Dept., School, Major)
_____ Changes in Degree Requirements
____ *Changes Involve Gen. Ed. requirements*

_____ Minor Changes to Existing Courses
_____ *Course is NOT General Education*
_____ *Course IS General Education*

_____ New Minor/Concentration/Specialization
_____ New Major/Degree Program
_____ Short Term Course Proposal

DEPARTMENT
(SIGNATURE INDICATES APPROVAL)

Ravi Ravindran 03/01/99
DEPT. CURRICULUM CHAIR / DATE

DEPT. CHAIRPERSON / DATE 06 MAR 99

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

X APPROVED

----- NOT APPROVED
Comments:

Robert P. Hecht 4/20/99
SIGNATURE DATE

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

✓ APPROVED

----- NOT APPROVED
Comments:

James A. Tracy 3/9/99
SIGNATURE (Academic Dean) DATE

SIGNATURE (Graduate Dean) DATE

UNIVERSITY CURRICULUM COMMITTEE

DATE OF OPEN HEARING (if necessary) 4/22/99

--- APPROVED

----- NOT APPROVED

Comments:

Pamela Reece 5/7/99
SIGNATURE DATE

SENATE

Date announced at Senate 4/30/99

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] 5/26/99

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED _____

HEGIS TAXONOMY & COURSE NUMBER ASSIGNED C909.413

DATE/SIGNATURE OF REGISTRAR Robert A. Kulat 7/6/99

NOTIFICATION FORWARD:

_____SENATE CURRICULUM COMMITTEE CHAIRPERSON

_____DEPARTMENT CHAIRPERSONS

_____ACADEMIC DEAN(S)

_____REGISTRAR

_____SPONSOR(S)

Course Proposal

1. Details:

a) Course Title:	Principles of Nondestructive Evaluation (0909.413)
b) Sponsor:	Dr. Shreekanth Mandayam
c) Credit Hours:	3 credit hours
d) Course Level:	Technology Focus Elective
e) Curricular Effect:	Available to engineering seniors as an elective
f) Co-requisites:	Concurrent enrollment in Senior Engineering Clinic I or II (0901.401 or 0901.402) OR
g) Suggested Time/ Scale of Implementation	Spring 2000 Permission of Instructor 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 will be available as a senior level technology focus elective to Engineering students.

Nondestructive evaluation (NDE) or nondestructive testing (NDT) refers to systems and processes that can be used to inspect a component for defects, without impairing its usefulness. NDE forms a vital part of the inspection procedure for aircraft, spacecraft, highways and bridges, power plants, gas and oil pipelines, etc. As the nation's key infrastructure is aging rapidly, federal mandates have necessitated advances in technology – research and development funding in this area in recent years bears witness to this fact. In addition, NDE has emerged as one of the critical factors in designing new products or components – "design for testing" is one of the paradigms employed by modern manufacturers. Furthermore, there exist over 300 large and small companies involved in NDE in the Delaware Valley region – providing engineering students with an exposure to this subject is advantageous.

The proposed course will provide students with an introduction to the principles traditional and emergent electromagnetic and electromechanical (ultrasonic) NDE methods. The design of NDE systems and the processing and interpretation of NDE signals will be covered. The associated laboratory will provide test cases for exercising the "design for test" paradigm.

3. Essence of the Course:

a) Objectives:

The proposed course has a number of objectives:

(i) Provide an introduction to the principles of electromagnetic and ultrasonic NDE techniques.

(ii) Provide a working knowledge of the mathematical tools for modeling NDE processes.

(iii) Provide a working knowledge of the techniques for designing NDE systems and procedures.

(iv) Provide a working knowledge of the state-of-the-art signal and image processing algorithms for interpreting NDE data.

(v) Provide examples of designing engineering components so that they can be tested using NDE methods.

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.

Introduction to NDE principles
- Energy-material interactions
- Modeling
- System design
- Signal processing

Case studies of NDE methods
- Optical
- Radiographic
- Magnetic
- Eddy current
- Ultrasonic
- Acoustic-emission
- Microwave
- Thermal

Sensor design techniques

Signal processing and analysis techniques

Design for testing

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: None
b) Consultants and Consultant Statements: (N/A)
c) Written Consultations: (N/A)

5. Additional Supporting Information:

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

1. D. E. Bray and R. K. Stanley, *Nondestructive Evaluation : A Tool in Design, Manufacturing, and Service*, CRC Press, 1997.
2. D. E. Bray and D. McBride, Eds., *Nondestructive Testing Techniques*, Wiley, 1992.
3. N. Ida, *Numerical Modeling for Electromagnetic Non-Destructive Methods*, Chapman and Hall, 1995.
4. P. McIntire, Ed., *Electromagnetic Testing : Eddy Current, Flux Leakage, and Microwave Nondestructive Testing*, ASNT, 1992.
5. L. Schmerr, *Fundamentals of Ultrasonic Nondestructive Evaluation : A Modeling Approach*, Plenum, 1998.

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

1. *Matlab & Associated Toolboxes*, The MathWorks Inc., Natick, MA.

6. Catalog Description:

Principles of Nondestructive Evaluation (0909.413)

Principles of nondestructive evaluation provides an introduction to contemporary and emergent methods for the non-invasive inspection of infrastructure composed of modern engineering materials. The course covers system design and the processing and analysis of nondestructive evaluation signals. Case studies on engineering design for testing are provided.

Senior elective. Concurrent enrollment in Senior Engineering Clinic I (0901.401), Senior Engineering Clinic II (0901.402), or permission of instructor required.