

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

PROPOSAL TITLE: Structural Acoustics (0910.552)
SPONSOR(S): Eric Constans
DEPARTMENT: Mechanical Engineering
COLLEGE: Engineering
IF LAS CHECK ONE: \_\_\_ History/Humanities \_\_\_ Math/Science \_\_\_ Social/Behavioral Sciences
Check one: \_\_\_ 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 Rishi Rameshwaran 2/24/00
Dept. Curriculum Chair/Date
TR Chandrasekhar 2/24/00
Dept. Chairperson/Date

ACADEMIC DEAN
Approved [check] Not Approved \_\_\_ Comments:
Dean's Signature/Date [Signature] 2/24/00

**COLLEGE CURRICULUM COMMITTEE**  
 Date of open hearing (if necessary) 2/28/01 Approved  Not Approved   
 Comments:  
 Signature of College Chair/Date: [Signature] 2/28/01

**UNIVERSITY CURRICULUM COMMITTEE**  
 Date Received/Processed 4/27/01  
 Comments:  
 Curriculum Chair Signature: [Signature] Date Announced At Senate 5-8-01

**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/Provost Signature/Date: [Signature]  
5/15/01

**REGISTRAR**  
 Date Approved Course Description Required 5/23/01  
 Hegis Taxonomy & Course Number Assigned \_\_\_\_\_  
 Registrar Signature/Date: [Signature]

**NOTIFICATION FORWARD**  
 \_\_\_\_\_ Senate Curriculum Committee Chairperson  
 \_\_\_\_\_ Academic Dean(s)  
 \_\_\_\_\_ Department Chairpersons  
 \_\_\_\_\_ Registrar  
 \_\_\_\_\_ Sponsor(s)

# Course Proposal

## 1. Details

- a) **Course Title:** Structural Acoustics (0910-552)
- b) **Sponsor:** Dr. Eric Constans, Department of Mechanical Engineering, College of Engineering
- c) **Credit Hours:** 3 credit hours
- d) **Course Level:** Graduate
- e) **Curricular Effect:** A Graduate level course for Mechanical Engineering majors.
- f) **Prerequisites:** Vibrations (0910.201)
- g) **Suggested Time** Fall 2001 / One section
- h) **Resources:** Faculty is in place to teach the course within the department of Mechanical Engineering. A Vibrations laboratory will be available to support this course. Computer hardware and software resources (including Matlab) are available in the Engineering Building to support this course.

## 2. Rationale

An understanding of the vibration behavior of continuous structures is a vital part of the education of mechanical engineers at the graduate level. This course covers the fundamentals of vibrational and acoustical behavior of structures. Topics covered include vibration of strings, bars, beams and plates. The application of theories learned in the course to actual design problems will be discussed. An introduction to the acquisition and analysis of acoustical and vibrational data is also included as a vital part of this course.

## 3. Essence of the Course:

### a) Objectives

Upon completion of the course, students will be able to

- Understand the wave equation and its applications to engineering structures.
- Predict resonance frequencies and mode shapes in strings, beams, plates and membranes.
- Apply material learned in the course to acoustic experimental design.

## **b) Topical Outline:**

The topics to be covered are listed below. The instructor will supply the students with a syllabus during the first week of classes. The instructor will assess any technology advances in the subject matter prior to the course and make topic changes deemed to be appropriate to maintain the level and currency of instruction.

### *Introduction – Fundamentals of Vibrations*

#### *Transverse Motion – The Vibrating String*

- The one-dimensional wave equation
- General solution to the 1-D wave equation
- Forced vibrations of a string of finite length
- Normal modes of the fixed-fixed string
- Effects of other boundary conditions on the vibration of a string

#### *Vibration of Bars*

- Longitudinal vibration of a bar
- Lateral vibration of a beam

#### *The Two-Dimensional Wave Equation*

- The wave equation for a thin membrane
- Vibration of thin plates

#### *The Acoustic Wave Equation and Simple Solutions*

- Equations of state and continuity
- The linearized wave equation
- Decibel scales
- The point source

#### *Acoustic Laboratory Techniques*

- Modal analysis of continuous structures
- Data acquisition: autospectra, cross-spectra, transducers

## **c) Evaluation and Grading Procedure of Students**

Student grades will be determined on the basis of examinations, homework and/or projects, laboratory projects and reports. A course syllabus with stated method of arriving at the final grade, e.g., number of exams, projects homework, percentage of grade, will be distributed to the students during the first week of classes. An independent project covering acoustic experimental design will be assigned.

## **d) Course Evaluation**

The course will be evaluated on the basis of student evaluations and curriculum review by appropriate faculty.

## **4. Results of Consultations**

The proposed course is an additional elective that would supplement the Engineering Curriculum Proposal approved by the Faculty Senate in December 1994.

## **Catalog Description**

### **Structural Acoustics (0910-552)**

Prerequisite: *Vibrations (0910.201)*

This course covers the fundamentals of vibrational and acoustical behavior of structures. Topics covered include vibration of strings, bars, beams and plates. The application of theories learned in the course to actual design problems will be discussed. An introduction to the acquisition and analysis of acoustical and vibrational data is also included as a vital part of this course.