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PROCESS A NON-GENERAL EDUCATION ~ **CURRICULUM PROPOSAL** SCC #03-04- 42

eadlines:
Regular proposals: October 3, 2003 to be implemented Fall 2004

PROPOSAL TITLE: Elastic Stability of Structures

Sponsor(s): Eric Constans E-Mail: constans@rowan.edu Ext: 5349

E-Mail: Ext.

DEPARTMENT: Mechanical Engineering

COLLEGE: Engineering

If Liberal Arts & Sciences CHECK : ___ **History/Humanities** ___**Math/Sciences** ___**Social/Behavioral Sciences**

_____ **UNDERGRADUATE** ___X___ **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

THE FOLLOWING SIGNATURES REPRESENT APPROVAL

Department Chair: _____ Date: 10.2.2003

Department Curriculum Chair: _____ Date: 10.2.2003

Academic Dean: _____ Date: 10.2.2003

UNIVERSITY CURRICULUM COMMITTEE

OPEN HEARING Date: 11-3 2003 Approved X Not Approved _____

COLLEGE CURRICULUM CHAIR: _____

Senate Curriculum Chair Signature: _____ Date: Senate Announcement/Vote: 11-10-2003

Comments: Library Resources Form completed by Marilyn Mackiewicz (e-mail)

EXECUTIVE VICE PRESIDENT/PROVOST Signature: _____ Date: 1/27/04

✓ Approved _____ Not Approved

REGISTRAR

Date: 2/3/04 Course Description Received & Approved ~ Hegis Taxonomy & Course 0910-554

Registrar Signature: _____

NOTIFICATION FORWARD

✓ SCC Chair ✓ Academic Dean ✓ Department Chair ✓ Registrar ✓ IR ✓ CAP ✓

___ VP Student Affairs ✓ Others

TM

Rec 2/16/04

OFFICE OF THE PROVOST
NOV 18 2003
ROWAN UNIVERSITY

402

SCC#03-04-402

Rowan University

CURRICULUM PROPOSAL

LIBRARY RESOURCE FORM

The purpose of this form is to provide a channel of communication between the library and faculty changing and designing new courses/programs. The information will be used to assess the resources available in the library, and to identify resources the library should acquire to support the course/program. The information will also provide rationale for institutional support for library acquisitions

This form should be completed in a coordinated effort between the course sponsor(s) and the academic department liaison librarian.

- The sponsor(s) complete parts A & D
  If assistance is required to complete parts A & D, please notify the liaison librarian.

- Forward this form to the librarian who will complete parts B, C, & E

This form must be completed and attached to the original curriculum proposal before being approved by the Senate Curriculum Committee

A. College Engineering Department Mechanical Engineering

Proposed by: Eric Constans Date: October 3, 2003

Course Title: Elastic Stability of Structures

Anticipated Date for Course/Program Offering: Fall 2005

B. Describe the resources available in the library to support this course/program, including reference, monographic, electronic databases, audio-visual materials, etc. A summary statement is sufficient.

Campbell Library acquires monographs in all aspects of Mechanical engineering through an approval plan that automatically supplies new titles from the major publishers in this field. Conference proceedings are also available upon request though the same plan. Numerous reference volumes will support this course. To include: Dictionaries, handbooks, standards, and encyclopedias published by McGraw Hill, Wiley, and ASME. Electronic databases that will support the course are: ASME Journals database; *Science Direct* which includes mechanical engineering journals titles published by Elsevier; Engineering Village which includes Compendex; General Science Full Text; and the Applied Science and Technology Index. The Library also provides faculty access to databases in the Scientific and Technology Network. Audio-visual materials have not been systematically acquired in this area, but can be purchased if needed.

C. List key periodicals available in the library to support this course/program.

International Journal of Solids and Structures
Various journals of the ASME held by the library.

D. List specific resources that should be acquired to support this course.

None

E. Librarian comments and recommendations:

Monographs, reference works, and journals holdings are adequate to support his course. Should other materials be needed, they will be purchased or acquired through document delivery services.

SCC#03-04-

NEW COURSE PROPOSAL

Details

a. Course Title:

Elastic Stability of Structures

b. Sponsor

Eric Constans, Mechanical Engineering

c. Credit Hours – 3

d. Course Level: Graduate Level

e. **Prerequisites:** Dynamics (0901.291), Solid Mechanics (0901.272)

f. **Suggested Time and Scale of Implementation:** To be offered every other year starting Fall 2004.

Curricular Effect

The proposed course will be offered as a graduate-level course for Mechanical and Civil Engineering students. Mechanical engineering Master's students are required to take six graduate level courses; this course will serve as one of these. Other engineering graduate students with the required prerequisites may also enroll in this course.

The proposed course will require no additional staff, space or other resources. No library resources will be required for this course.

Rationale

Many important structures (e.g. buildings, bridges, aircraft frames) have buckling as a primary mode of failure. In fact, many design codes in engineering are based upon the buckling failure mechanism, rather than bending or compression. Because of this, it is important for structural engineers to have at least a cursory knowledge of elastic stability phenomena.

Essence of the Course

a. Objectives

This course will provide graduate-level Mechanical Engineering students with an overview of elastic stability in structures, and a brief introduction to dynamic stability, as applied to rotating shafts. Applications of mathematical theory to real-world structural design problems will be emphasized.

Each graduate student in the course will be required to design and fabricate an apparatus that demonstrates one of the major instability phenomena covered in the course. At the end of the semester each graduate student will lead a seminar in which the apparatus is exhibited and explained to students in the undergraduate section of the course.

b. Topical Outline/Content

1. Introduction
   - Stability or instability of structures
   - Continuous deformable elastic bodies

2. Mechanical Stability Models
   - 1 DOF models
   - 2 DOF models
   - Snapthrough model

3. Elastic Buckling of Columns
   - Beam theory
   - Buckling of columns
   - Elastically supported columns
   - Critical spring stiffness

4. Columns on elastic foundations
   - The pinned-pinned column
   - Rayleigh-Ritz solution

5. Buckling of rings and arches
   - The thin circular ring
   - High circular arches under pressure
   - Shallow arches

6. Nonconservative systems and dynamic buckling
   - Strain energy
   - Principle of virtual work
   - Whirling of high-speed shafts

c. Evaluation of students and grading procedure

Students will be evaluated through in-class examinations and completion of problem sets. They will also be evaluated on their performance in student-led seminars / demonstrations at the end of the semester.

d. Course evaluation

The success of the course in meeting course goals will be determined through use of in-class examinations, the quality of student presentations, and student evaluations.

Letters of Consultation

The proposed course involves topics of primarily a Mechanical Engineering nature. As structural stability is of interest to civil engineers, a letter from the Civil Engineering department is attached.

Catalog Description

Elastic Stability of Structures (Suggested HEGIS Number 0910.554)
Many important structures (e.g. buildings, bridges, aircraft frames) have buckling as a primary mode of failure. Because of this, it is important for structural engineers to have at least a cursory knowledge of elastic stability phenomena. This course will provide graduate-level Mechanical Engineering students with an overview of elastic stability in structures, and a brief introduction to dynamic stability, as applied to rotating shafts. Applications of mathematical theory to real-world structural design problems will be emphasized.

ROWAN UNIVERSITY

Civil and Environmental Engineering

September 26, 2003

Eric Constans, Ph.D.
Assistant Professor
Mechanical Engineering
College of Engineering
Rowan University
Glassboro, New Jersey 08028

Dear Professor Constans:

I am writing to endorse your course proposal entitled Elastic Stability of Structures. This is an important engineering mechanics course and the topics proposed are of value to both Mechanical and Civil Engineering seniors. Civil Engineering students who want to specialize in structural engineering will especially appreciate this new course.

Sincerely,

Ralph Alan Dusseau, Ph.D., P.E.
DRBA Professor and Founding Chair

RAD:amd

Encl.

201 Mullica Hill Road • Glassboro, New Jersey • 08028-1701 • Phone: (856) 256-5320 • Fax: (856) 256-5242