

CURRICULUM PROPOSAL FORM 1999-2000

NON-GENERAL EDUCATION PROCESS A

RECEIVED

*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: Introduction to the Mechanics of Continuous Media (0910.451)

SPONSOR(S): Dr. Paris R. von Lockette

DEPARTMENT: Mechanical Engineering

COLLGE: Engineering

IF LAS CHECK ONE: History/Humanities Math/Science Social/Behavioral Sciences

Check one: Undergraduate Graduate

0910 451

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

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)

Paris R. von Lockette 10/20/99

Dept. Curriculum Chair/Date

TR Chandrasekhar 10/22/99

Dept. Chairperson/Date

ACADEMIC DEAN

Approved Not Approved Comments:

Dean's Signature/Date J. P. [Signature]

COLLEGE CURRICULUM COMMITTEE

Date of open hearing (if necessary) 12-8-01 Approved Not Approved

Comments:

Signature of College Chair/Date: Ravi Prakash Ramakrishnan

UNIVERSITY CURRICULUM COMMITTEE

Date Received/Processed 5/29/01

Comments:

Curriculum Chair Signature: Walter D. Kelly Date Announced At Senate 5/29/01

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 C. K. Pusey 6/5/01

REGISTRAR

Date Approved Course Description Required _____
Hegis Taxonomy & Course Number Assigned _____

Registrar Signature/Date E. C. Kelly 6/5/01

NOTIFICATION FORWARD

Senate Curriculum Committee Chairperson

12/18/01
 Academic Dean(s)

Department Chairpersons

Registrar
Senate Pres.
 Sponsor(s)

✓

Course Proposal

1. Details:

- a) Course Title:** Introduction to the Mechanics of Continuous Media (0910.451)
- b) Sponsor:** Dr. Paris R. von Lockette, Department of Mechanical Engineering, College of Engineering
- c) Credit Hours:** 3 credit hours
- d) Course Level:** Senior
- e) Curricular Effect:** Elective course for chemical, civil, electrical, and mechanical engineering undergraduate students
- f) Prerequisites:** Engineering Analysis II or Equivalent, Solid Mechanics
- g) Suggested Time/
Scale of Implementation** One section during spring semesters
- h) Resources:** Faculty: Existing faculty can teach this course
Library: No library acquisitions will be required
Equipment: No laboratory equipment will be required
Computers: Computer laboratory access will be required and additional software may be acquired.

2. Rationale:

The proposed course is an additional engineering elective that would supplement 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 course provides the students with an introduction to the field of continuum mechanics. Continuum mechanics creates a common framework for the study of all materials that will enable the student to gain deeper understanding of the relationships between areas of past and possible future study including for example fluid dynamics and solid mechanics. Continuum mechanics draws on the student's knowledge of physics, mathematics and thermodynamics to deliver a unified approach to the formulation and solution of the most general mechanics problems and is therefore a natural extension of previous undergraduate coursework.

3. Essence of the Course:

The overarching goal of the course is to provide students with an understanding of the continuum mechanics approach. At the top are the physical laws that must always hold true, i.e. conservation laws. Below the physical laws are the constitutive relations such as Hooke's law that determine the peculiarities of specific materials. And finally, the physical laws and the constitutive relationships are applied in the formulation and subsequent solution of boundary

Catalog Description:

Introduction to the Mechanics of Continuous Media (0901.451)

Prerequisites: Engineering Analysis II or Equivalent, Solid Mechanics

The fundamental concepts governing the behavior of continuous media, primarily solids, are introduced. Governing equations are derived from the conservation of mass, momentum, and energy. Constitutive laws are employed in the solution of boundary value problems in both Cartesian and curvilinear coordinate systems. Classical solutions are examined. Since many boundary value problems do not have closed form solutions, numerical solution techniques such as the finite difference method are employed.

value problems. Since many boundary value problems do not have closed form solutions, numerical solution techniques will be examined.

a) Objectives:

Upon completion of the course, the students will be able to

1. Perform tensor operations/transformations.
2. Determine principal stress/strain directions and values.
3. Derive equilibrium equations governing continuous bodies.
4. Formulate mechanics problems in terms of physical laws, constitutive laws, and boundary conditions.
5. Apply various analytical and numerical solution techniques to boundary value problems.
6. Work in either Cartesian or polar coordinate frames.

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.

Introduction

Tensor Operations
Tensor Transformations
Indicial Notation
Calculus of Tensor Fields
Basic principal Stress Value and Direction Calculations

Linear Continuum Mechanics

Kinematics:

Eulerian vs. Lagrangian
In/Homogeneous Deformations
Strain Definitions
Compatibility

Loading: Tractions and Body Forces

Kinetics: Conservation of Mass, Momentum and Energy

Governing Equations

Constitutive Laws:

Hookean Solids
Newtonian Fluids

Introduction to Boundary Value Problems

Problem Formulation:

Determination of Governing Equations
Determination of Boundary Conditions

Analytical Solution Techniques: Methods of Differential Equations
Classical Solutions
Numerical Solution Techniques:
Finite Difference
Conjugate Gradient Methods

Advanced Topics
Curvilinear Coordinates Systems
Nonlinear (Finite) Elasticity

c) Evaluation and Grading Procedure of Students:

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

d) Course Evaluation:

The proposed 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. Consultations were submitted with original proposal as specified by the Curriculum Committee

From: Douglas B. Cleary
To: Clay Gabler
Date: 2/29/00 2:52PM
Subject: course

The proposed course, Introduction to Continuum Mechanics, will serve the Civil and Environmental Engineering Department as well as the Mechanical Engineering Department. Particularly at the graduate level, civil engineering students have a need for understanding the mechanics of continuous bodies as well as the concepts of yield criteria and yield surfaces. The Civil and Environmental Engineering Department does not have its own course that addresses this need. If the proposed course is added, Civil Engineering students would also take it. This course will allow them to formulate and solve a variety of problems which they will encounter in the future. The course will help them develop a deeper understanding of material failure mechanisms. This understanding is especially important for situations not addressed in design codes.

Douglas B. Cleary, Ph.D., P.E.
Associate Professor
Rowan University
201 Mullica Hill Road
Glassboro, NJ 08028

856-256-5325
856-256-5241 (fax)

From: Paris R. Von Lockette
To: Wiest.EMP_PO.ROWANDOM, Chin.EXCHANGE.Exchange
Date: 11/2/01 1:47PM
Subject: RE: (SCC#99-00-435) & SCC#99-00-416

Hello Roe,

The undergraduate class should have the prerequisites you stated but changing "solid mechanics" to "solid mechanics". See below:

(SCC#99-00-416) Intro to the Mechanics of Continuous Media -
Prerequisites: Engineering Analysis II or Equivalent, Solid Mechanics

solid
~~Solid~~
undergrad

*# 99-00
SCC435*

The graduate class should have no prerequisites listed. I apologize for the confusion.

Sincerely,

Paris

<<< Chin, Steven 11/ 1 6:42p >>>
Roe,

I am going to defer to Paris.

Paris: By copy of this email, can you confirm?

Thanks,

Steve

-----Original Message-----

From: Wiest, Rosemarie
Sent: Thursday, November 01, 2001 4:38 PM
To: Chin, Steven
Cc: Von Lockette, Paris R.
Subject: (SCC#99-00-435) & SCC#99-00-416

Dr. Chin,

I got the proposals back, but the originals are not corrected.
Is it suppose to be :

(SCC#99-00-435) Mechanics of Continuous Media -
Prerequisites: Engineering Analysis II or Equivalent, Sold Mechanics

and

(SCC#99-00-416) Intro to the Mechanics of Continuous Media -
Prerequisites: Engineering Analysis II or Equivalent, Sold Mechanics

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~~Senior~~
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Free /
D.P.

Office of the Executive Vice President / Provost

Date: December 12, 2001

To: Ed Eigenbrot, Registrar

From: Rosemarie Wiest
Provost Office

re: phd. 12/17/01

RE: Mechanics of Continuous Media (0910.551) SCC#99-00-435

The Provost has signed this course and I am forwarding it to you.
Get back to me with any problems or concerns.

Encl: SCC#99-00-435