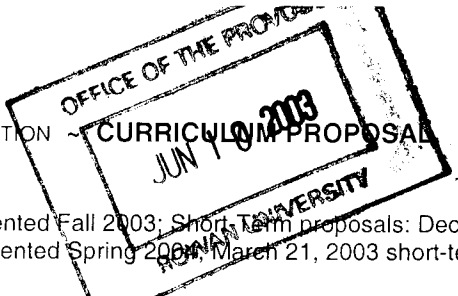


**PROCESS A** NON-GENERAL EDUCATION



SCC #02-03- 405

**Deadlines:**

Regular proposals: October 18, 2002 to be implemented Fall 2003; Short-Term proposals: December 6, 2002 to be implemented Fall 2003  
Regular proposals: February 14, 2003 to be implemented Spring 2004; March 21, 2003 short-term courses to be implemented Spring 2004

**PROPOSAL TITLE:** Fundamentals of Crash Safety Engineering

Sponsor(s): Clay Gabler E-Mail: gabler@rowan.edu Ext: 5346  
E-Mail: \_\_\_\_\_ Ext: \_\_\_\_\_  
E-Mail: \_\_\_\_\_ Ext: \_\_\_\_\_

**DEPARTMENT:** Mechanical Engineering

**COLLEGE:** Engineering

If Liberal Arts & Sciences CHECK :  History/Humanities  Math/Sciences  Social/Behavioral Sciences  
 UNDERGRADUATE  GRADUATE

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)
- Existing non-gen-ed course
- Non-gen-ed degree requirements
- Major
- Minor, specialization, concentration, track, certificate program

**The following signatures REPRESENT APPROVAL**

Department Chair: D. Chadmystra Date: 2/14/03  
 Department Curriculum Chair: H. C. M. Date: 2/14/2003  
 Academic Dean: Steve Chew Date: 2/17/03  
 College Curriculum Chair: Kim O. Johnson Date: 5/12/03  
 College Curriculum Committee OPEN HEARING Date: 4/11/03 Approved  Not Approved

**UNIVERSITY CURRICULUM COMMITTEE**

Senate Curriculum Chair Signature: Phillip L. Lewis Date: 6/10/2003

Comments: \_\_\_\_\_  
EXECUTIVE VICE PRESIDENT/PROVOST Signature: Helen Gale, J.D. Date: 6/27/03

Approved ~ Not Approved due to the following:  Student Cr Hrs  Faculty Load Hrs  Equalized Cr Hrs

**REGISTRAR**

Date: 7/31/03 Course Description Received & Approved ~ Hegis Taxonomy & Course #: 0410.575  
Registrar Signature: E. C. Egle Jr. 7/31/03

**NOTIFICATION FORWARD**

SCC Chair  Academic Dean  Department Chair  Registrar  Sponsor(s)

TM/ 8/13/03

Rowan University  
**LIBRARY RESOURCES**  
 to

**SUPPORT A NEW COURSE or NEW PROGRAM PROPOSAL**

The purpose of this form is to provide a channel of communication between the library and faculty 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: Clay Gabler Date: April 21, 2003

Course Title: Fundamentals of Crash Safety Engineering

Anticipated Date for Course/Program Offering: Fall 2004

- 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 these fields. Conference proceedings are available upon request through the same plan. Numerous reference volumes will support this course to include: Dictionaries, handbooks, standards, and encyclopedias published by IEEE, McGraw Hill, Wiley, and CRC. Electronic databases that will support the course are: *Science Direct* which includes mechanical engineering journal titles published by Elsevier; Engineering Village which includes Compendex.; General Science Full Text, and the Applied Science and Technology Index. Audio-visual materials have not been systematically acquired in this area, but can be purchased as needed.

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

Journal of Safety Research  
 Transportation Research

- 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 this course. If other materials should be needed, they will be purchased or acquired through document delivery services.

# SCC#02-3-405

## NEW COURSE PROPOSAL

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### **Details**

**a. Course Title:**

Fundamentals of Crash Safety Engineering

**b. Sponsor**

Clay Gabler, Mechanical Engineering

**c. Credit Hours – 3**

**d. Course Level:** Graduate

**e. Prerequisites:** Dynamics (0901.291)

*we don't put  
undergrad prereqs  
on grad courses  
s. 12/26/03  
2/10/03*

**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 elective for Mechanical Engineering students. Other engineering students with the required prerequisites may also enroll in this course. The course was successfully offered in Fall 2002 as a special topics course. Like the special topics course, the proposed course will require no additional staff, space or other resources. The only library resources required for this course, like the special topics course, will be access to the electronic journals already maintained by the Library.

### **Rationale**

In most engineering courses, students develop designs assumed normal operation of a system or device. The proposed course will offer graduate engineering students the opportunity to design systems (highway vehicles) to protect their users during a catastrophic failure of the system. The course offers a unique perspective on the societal implications of technological systems and the need to consider design systems with human-machine interaction in mind.

## ***Essence of the Course***

### **a. Objectives**

The goal of this course is to present the fundamentals of crashworthiness design and analysis for cars and light trucks. Both current and emerging methods for crashworthiness engineering will be explored. The course will encompass three major focus areas: the crash response of (1) the vehicle structure, (2) the occupant, and (3) the occupant restraints. Topics will include the analysis of crash tests, vehicle crash kinematics, vehicle modeling, the biomechanics of impact injury, occupant modeling, and airbag design. Students will investigate emerging problems in crash safety engineering by completion and presentation of an independent project.

### **b. Topical Outline/Content**

#### 1. Introduction

#### 2. Vehicle Impact Response

- Vehicle Crash Kinematics
- Analysis of Crash Tests
- Vehicle Impact Modeling
- Simulation Methods
- Model Extraction Techniques
- The SISAME Code

#### 3. Occupant Impact Response

- Biomechanical Injury Criteria
- Anthropomorphic Crash Test Dummies
- Injury Severity Scales: AIS and alternative metrics
- Occupant Modeling
- The MADYMO Code

#### 3. Occupant Restraint Design

- Restraint Systems
- Airbag Design
- Bag Geometry, Folding, Tethers
- Sensors
- Inflator

#### 4. Advanced Topics

**c. Evaluation of students and grading procedure**

Students will be evaluated through in-class examinations, completion of a final project, and in-class presentations.

**d. Course evaluation**

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

***Letters of Consultation***

The proposed course involves topics of primarily a Mechanical Engineering nature. As there is some reference to human injury tolerance, a letter of consultation is attached from the Department of Biological Sciences.

## ***Catalog Description***

### **Fundamentals of Crash Safety Engineering (Suggested HEGIS Number 0910.575)**

This course will present current and emerging methods of crashworthiness design and analysis for cars and light trucks. The course will encompass three major focus areas: the crash response of (1) the vehicle structure, (2) the occupant, and (3) the occupant restraints. Topics will include the analysis of crash tests, vehicle crash kinematics, vehicle modeling, the biomechanics of impact injury, occupant modeling, and airbag design. Students will investigate emerging problems in crash safety engineering by completion and presentation of an independent project. Prerequisite: Dynamics (0901.291)

February 20, 2003

Dr. Clay Gabler  
Department of Mechanical Engineering  
Rowan University

Dear Clay:

Members of my department and I have reviewed your course proposals for Crash Safety Engineering, and we endorse the proposals. The course content is very interesting, and we see no problem with these offerings.

Please do not hesitate to contact me if I can be of further assistance.

Sincerely,

Dr. Patricia Mosto  
Chair and Professor  
Biology Department  
Rowan University  
856-256-4834  
mosto@rowan.edu



## Memorandum

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**To:** Phil Lewis  
Chair, University Curriculum Committee

**From:** H. Clay Gabler  
Associate Professor of Mechanical Engineering

**RE:** New Course Proposals – Crash Safety

**Date:** April 21, 2003

I have submitted two new course proposals to you on Crash Safety Engineering – Introduction to Crash Safety Engineering and Fundamentals of Crash Safety Engineering. Introduction to Crash Safety Engineering (SC-02-03-406) will be taught as an undergraduate engineering course. Fundamentals of Crash Safety Engineering (SC-02-03-405) will be offered as a graduate engineering course.

Although the courses will share common lecture content, the graduate course, unlike the undergraduate course, has a significant independent study component as described in the course proposal. The graduate course will require that the students research an emerging topic in crash safety chosen in consultation with the instructor, submit a research paper on the student's findings, and present a full-length lecture on this topic to the undergraduate course participants. In the Fall 2002 special topics course on which the proposed course is based, this independent project accounted for 20% of the graduate grade. The independent project lectures were very well received by both undergraduate and graduate students, and will be continued in the proposed course.