APPROVED

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MAR - 8 2015
COLLEGE OF GRADUATE STUDIES

The University Of Toledo

New Graduate Course Proposal

* denotes required fields

1. College*: College of Engineering

   Department*: Mechanical Industrial and Manufacturing Engi

2. Contact Person*: Mohammad Elahinia Phone: 530-8224 (xxx - xxxx) Email: mohammad.elahinia@utoledo.edu

3. Alpha/Numeric Code (Subject area - number)*: MIME - 8910

4. Proposed title*: Engineering Analysis of Sma

   Proposed effective term*: 201640 (e.g. 201140 for 2011 Fall)

5. Is the course cross-listed with another academic unit? ○ Yes ◉ No

   Approval of other academic unit (signature and title)

   Is the course offered at more than one level? √ Yes ◉ ~~No~~

   If yes, an undergraduate course proposal form must also be submitted. If the undergraduate course is new, complete the New Undergraduate Course Proposal; if the undergraduate course is existing, submit an Undergraduate Course Modification Proposal.

6. Credit hours*: Fixed: 3 or Variable: to

7. Delivery Mode:

	Primary*	Secondary	Tertiary
a. Activity Type *	Lecture	--SelectType--	--SelectType--
b. Minimum Credit Hours *	3		
Maximum Credit Hours *	3		
c. Weekly Contact Hours *	3		

8. Terms offered: ☑ Fall ☐ Spring ☐ Summer

   Years offered: ○ **Every Year** ◉ **Alternate Years**

9. Are students permitted to register for more than one section during a term? ◉ No ○ Yes

   May the courses be repeated for credit? ◉ No ○ Yes Maximum Hours

10. Grading System*:
    - ◉ Normal Grading (A-F, S/U, WP/WF, PR, I)
    - ○ Satisfactory/Unsatisfactory (A-C, less than C)
    - ○ Grade Only (A-F, WP/WF, PR, I)
    - ○ Audit Only
    - ○ No Grade

11. Prerequisites (must be taken **before**): i.e. C or higher in (BIOE 4500 or BIOE 5500) and C or higher in MATH 4200

PIN (Permisson From Instructor) PDP (Permission From Department)

Co-requisites (must be taken **together**):

12. Catalog Description* (**75 words Maximum**)

Smart material systems are becoming increasingly important in aerospace and automotive industries. Therefore, it is important to expose students to this area. Graduate Engineering students who are interested in learning about smart material systems will benefit from this course. Prerequisites are undergraduate courses in differential equations, dynamics, and vibration.

13. Attach a syllabus and an electronic copy of a complete outline of the major topics covered. Click here for template.

File Type	View File
Syllabus	View

14. Comments/Notes:

15. Rationale:

Course Approval:

		Date
Department Curriculum Authority:	Matthew Franchetti	2014/12/07
Department Chairperson:	Abdollah Afjeh	2015/01/30
College Curriculum Authority or Chair:	Efstratios Nikolaidis	2015/03/06
College Dean:	Mohamed Samir Hefzy	2015/03/08
Graduate Council:		2015/05/12 GC 4.21.2015

Dean of Graduate Studies: Date 5-12-2015

Office of the Provost : Date

print

Administrative Use Only

Effective Date: (YYYY/MM/DD)

CIP Code:

Subsidy Taxonomy:

Program Code:

Instructional Level:

Registrar's Office Use Only

Processed in Banner on:

Processed in Banner by:

Banner Subject Code:

Banner Course Number:

Banner Term Code:

Banner Course Title:

MIME 6910/8910, Engineering Analysis of Smart Material Systems
Next will be offered in Fall 2016

Instructors: Dr. Mohammad Elahinia (mohammad.elahinia@utoledo.edu) 419- 530 8224

Text: Donald J. Leo, *Engineering Analysis of Smart Material Systems*, Wiley, 2007.
Mohammad Elahinia, *Shape Memory Alloy Actuators: Modeling, Simulation, and Control, Wiley, 2014*

Students: Smart material systems are becoming increasingly important in aerospace and automotive industries. Therefore, it is important to expose students to this area. Graduate Engineering students who are interested in learning about smart material systems will benefit from this course. Prerequisites are undergraduate courses in differential equations, dynamics, and vibration.

Content: In this course we will study the fundamental concepts behind different types of active materials. We will emphasize our discussion around current research topics in the different fields such as sensing, actuation, energy harvesting, and biomedical devices. We will also discuss engineering applications of active materials.

Topics: The course will focus on five main topics:

1. Piezoelectric materials
2. Shape memory alloys
3. Electroactive polymers
4. Magnetorheological fluids
5. Smart material system applications: motion control, passive and semi-active damping, active vibration control, and power harvesting

There will be 1 homework assignment per week. Homework assignments might consist of working problems and reading/reporting on research papers. We will also have classroom demonstrations and laboratories. The laboratories will require a written report. We will have approximately 3 of these during the semester.

Ph.D. students must complete an additional project on smart materials or simulations, and solve an additional problem in selected assignments. These problems are marked "for Ph.D. students"

Grade:
45% Homework, Simulations, Reports, and Presentations
25% Project
30% Exams

Final Project: This course requires each student to complete a special project in smart material systems. A written paper describing the project is to be submitted by the due date. A proposal describing the project topic and scope is due according to the course schedule. The project must be clearly related to this course and is subject to the instructor's approval. The project report may take one of three forms:

1. A detailed survey paper, which describes a special topic in smart material systems
2. An in-depth theoretical and numerical analysis of a specific problem in smart material systems
3. A smart material systems related experiment, which makes use of methods described in the course