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Contemp. Topics in Solid Mechanics - Course Syllabus

Course Number: ME410

Course Title: Contemp. Topics in Solid Mechanics

Academic Semester: Spring **Academic Year:** 2015/ 2016
Semester Start Date: Jan 24, 2016 **Semester End Date:** May 19, 2016

Class Schedule: SUN / TUE 9 to 10.30 AM

Classroom Number: TBD

Instructor(s) Name(s): GILLES LUBINEAU
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Office Location: BLDG 4 ROOM 2216

Office Hours: SUN / TUE 3 to 4 PM

Teaching Assistant name: NONE

Email:

COURSE DESCRIPTION FROM PROGRAM GUIDE

Lecture and/or seminar course on advanced topics in solid mechanics. Topics are determined by the instructor and may vary from year to year. The course may be repeated for credit.

COMPREHENSIVE COURSE DESCRIPTION

General Philosophy of the class

This class is highly research oriented and aims to improve for each involved student, his understanding of his research topics and relevant literature, his abilities to present and communicate about his research field, to help him to identify the key strategic objectives and to work towards them in the framework of publication.

As a 400 level class, this is a highly research oriented class that should be taken only by students who already have a robust general Solid Mechanics background and are actively engaged in Solid Mechanics oriented research. The public is typically first or second year PhD students in Solid Mechanics, who are willing to improve their theoretical skills and general understanding of the field. It aims to give them the minimum "expert-level" background so they can successfully address their research, and to help them to critically analyze their research field and define their research objective.

This class is also motivated by the observation that a highly multidisciplinary background is now necessary to handle modern composite problems. To quickly become efficient in a composite lab/team, students must be able to handle a wide range of experimental/computational techniques that often belong to very different fields, ranging from chemical engineering, electrical engineering, material science to mechanical engineering.

This class will be articulated round three main activities: (1) Student driven research presentation (2) Faculty driven technical presentations

Research part:

Three typical research topics of interest to the attending students will be selected. For each topic, students will have to perform literature reviews and to deliver technical seminars about these literature reviews, to propose a research plan and to articulate with the existing state of the art literature, to write draft papers and to get them reviewed by their peers.

Presentations will be giving by the faculty about how to efficiently perform literature reviews, generate research directions, make reviews and work towards a structures solid mechanics papers. 3 papers about each topic that will be submitted by the student will conclude this research part

Technical improvement part:

Three topics will be covered as technical improvement topics: laminate theories, fracture mechanics and micromechanics. For each topic (4 lectures per topics), we will review the concept, precise equation, and focus on solving some classical related problems that are usually used in solid mechanics research.

This is a challenging class open to highly motivated students, and demands a very large investment of its participants.

GOALS AND OBJECTIVES

- To provide the needed multidisciplinary background to be readily operational in a composite oriented laboratory,
- To review the variety of computational and/or characterization techniques that are very specialized to composite materials,
- To analyze with students a number of critical topics related to composite science among which: laminate theory, fracture mechanic and micromechanics

REQUIRED KNOWLEDGE

ME 211A or ME 212A, AMCS 201, 202. Strong basis in theoretical mechanics, numerical analysis and experimental mechanics are required.

REFERENCE TEXTS

Manual on experimental methods for mechanical testing of composites. C.H. Jenkins. Fairmont Press.

Experimental characterization of advanced composite materials. L.A. Carlsson, D.F. Adams and R. Byron Pipes. CRC Press

Advanced Topics in Characterization of composites. Michael Kessler.

Introduction to thermal analysis. Michael E. Brown

METHOD OF EVALUATION

Graded content

- The second literature review presentation of the students will be for one third of the total grade. In this course, students will be asked to give 2 literature review presentations. During the first one, they will get comments and advice from the instructor about how to improve. During the second one, they will have to present an improved literature review presentation as well as a potential research plan for their paper. Students will be evaluated during this second session about how they improved, constructed their review and used it to build their research plan.
- Final paper draft will be for one third of the grade
- A final exam will be given about the three technical topics (laminates, fracture mechanics and micromechanics) and will be for one third of the grade.

COURSE REQUIREMENTS

Assignments

- assigned reading for each literature review
- preparation of talks
- preparation of final paper
- assignments for each technical topic

Course Policies

No absence will be accepted except for an exceptional reason with full justification. Assignments can be made in group, and should be considered as a route to learning rather than a grading tool. That means all students should ask extensive questions if they do not understand the assignment so everyone is able to complete 100% of the questions.

Asking questions in class or office hours is a key point for your success. In case you don't understand something, it is likely you are not the only one. So do not hesitate, stupid questions do not exist!

Additional Information

NOTE

The instructor reserves the right to make changes to this syllabus as necessary.