Vm305: INTRODUCTION TO FINITE ELEMENTS IN MECHANICAL ENGINEERING (SUMMER 2016)

Instructor:
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Office hours: TBD by doodle

Prerequisite:
Vm211, Introduction to Solid Mechanics, or equivalent

Textbook:
There is no required text. Lecture notes will be made web-accessible via Sakai website: http://sakai.umji.sjtu.edu.cn/portal
The following book is recommended:
Jacob Fish and Ted Belytschko, *A First Course in Finite Elements*, Wiley, 2007.

When:
Tuesdays and Thursdays: 16:00-17:40.
Lab days are marked with shadow below.

Week #	S	M	T	W	Th	F	S
1	15	16	17	18	19	20	21
2	22	23	24	25	26	27	28
3	29	30	31	1	2	3	4
4	5	6	7	8	9*	10	11
5	12	13	14	15	16	17	18
6	19	20	21	22	23	24	25
7	26	27	28	29	30	1	2
8	3	4	5	6	7	8	9
9	10	11	12	13	14	15	16
10	17	18	19	20	21	22	23
11	24	25	26	27	28	29	30
12**	31	1	2	3	4	5	6

* No class. Holiday (Dragon Boat Festival).
** Week for final exam.

Where:
Lecture: Dong Xia Yuan (东下院), Room 405
Computer lab location: Yu Liming Student Center, JI Building, 3rd Floor

Attendance of the lectures and labs are both mandatory. Attendance of the lectures will be randomly taken beginning from the week of May 30 in the form of in-class quizzes. These quizzes account for 3% towards your final grade. Attendance of the labs will also be taken, as there is information given during the lab sessions that is not provided in class lectures. There are 7 labs during the semester. Each lab attendance counts for 1% towards your final grade.

Website:
You will find the Vm305 Website at http://sakai.umji.sjtu.edu.cn/portal

Homework:
Graded homework is **the essential** part of this course. There will be 6 homework sets. Each homework assignment is worth 10% of your total grade. Late homework will be accepted but incurs a 5% penalty for every day it is late (weekends count as 1 day); therefore, you can always turn a homework assignment in and receive some credit for it. **It is better to turn in an assignment, even if it is very late, than not turn it in at all.** Homework is due at the beginning of the class period and will be considered late if not turned in by 16:00 on the due date. There are **no exceptions** to this grading schedule unless you contact Prof. Shen **prior** to the due date/time. Homework should be submitted by uploading your file on your Sakai Drop Box. Accepted formats are PDF, HyperWorks formats, and a .zip containing such files.
You will need the software HyperWorks to complete the assignments. Please follow the installation guide on Sakai to install the student editions of these.

Examinations:
There will be one in-class mid-term examination and one in-class final examination. For the mid-term exam, you are allowed to bring one A4 sheet of notes; for the final exam, you are allowed to bring two A4 sheets of notes.
Each exam is worth 15% of the total grade.

Exam Dates:
Midterm Exam: June 28, in class
Final Exam: TBA, but in the week of July 31.

Honor Code:
http://umji.sjtu.edu.cn/academics/academic-integrity/honor-code/
Homework policy: You can discuss homework assignments with classmates but must produce your own assignments to turn in.

COURSE PROFILE COURSE NUMBER: Vm305	COURSE TITLE: Introduction to Finite Elements in Mechanical Engineering
BULLETIN DESCRIPTION: Introduction to theory and practice of the finite element method. One-dimensional, two-dimensional, and three dimensional elements are studied, including structural elements. Primary fields of applications are strength of materials (deformation and stress analysis) and dynamics and vibrations. Extensive use of commercial finite element software packages, through computer labs and graded assignments. Two hour lecture and one hour lab.	COURSE TOPICS: 1. Introduction 2. Uniaxial rod element: rod stiffness matrix 3. Finite element assembly process 4. Finite element solution techniques 5. Truss elements 6. Beam/frame elements 7. Plate/shell elements 8. Structural analysis 9. Selected analysis types: heat conduction, modal analysis, buckling analysis 10. Introduction to design optimization using finite elements 11. Use and application of commercial finite element software

COURSE OBJECTIVES: for each course objective, links to the Program Outcomes are identified in brackets.	1. To teach students how to model and analyze mechanical systems using finite element analysis [1, 3, 5, 11] 2. To teach students the underlying concepts of finite element analysis and finite element software [1, 11] 3. To teach students the basic skills in using commercial finite element software and effective presentation of their analysis results [7, 11] 4. To reinforce students' understanding of engineering through the analysis of real-world problems [1, 11]
COURSE OUTCOMES: for each course outcome, links to the Course Objectives are identified in brackets.	1. Given a structural engineering problem, identify the necessary information required to conduct a structural analysis using a finite element software [1, 2, 3] 2. Assess the quality of finite element models of mechanical systems [1, 2, 4] 3. Use finite element software to develop models of mechanical systems [1, 3, 4] 4. Interpret the solutions obtained from finite element analyses [3, 4] 5. Using a finite element software, conduct structural analyses and selected other analysis classes, e.g., normal modes/natural frequency analysis, steady-state heat conduction analysis, buckling analysis, design optimization [1, 3, 4] 6. Recommend finite element software based upon company/client needs [2, 3, 4]
ASSESSMENT TOOLS: for each assessment tool, links to the course outcomes are identified	1. Regular homework problems 2. Exams