课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	**课程名称 Course Title**	**计算固体力学 Computational Solid Mechanics**
2.	**授课院系 Originating Department**	力学与航空航天工程系 Department of Mechanics and Aerospace Engineering
3.	**课程编号 Course Code**	MAE310
4.	**课程学分 Credit Value**	3
5.	**课程类别 Course Type**	专业核心课 Major Core Courses
6.	**授课学期 Semester**	春季 Spring
7.	**授课语言 Teaching Language**	英文 English
8.	**授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation& Contact （For team teaching, please list all instructors）**	刘轶军 讲座教授 力学与航空航天工程系 liuyj3@sustech.edu.cn LIU Yijun, Chair Professor Department of Mechanics and Aerospace Engineering liuyj3@sustech.edu.cn
9.	**实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact**	待公布 To be announced
10.	**选课人数限额(可不填) Maximum Enrolment （Optional）**	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
学时数 Credit Hours	48	12			60

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	MAE202 材料力学 MAE202 Mechanics of Materials
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	
14.	其它要求修读本课程的学系 **Cross-listing Dept.**	

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程将为学生重点讲授有限元法的基本原理和在结构应力及振动分析中的应用：包括 1D/2D/3D 单元构建、方程组装求解、计算机编程、商用软件实际操作、和实际工程问题建模求解技巧。

This course will provide students with a solid foundation of the finite element method, and skills in its software development and applications in solving practical problems in structural stress and dynamics analyses. Students will have the grasp of the 1D/2D/3D element formulations, assembly of the equations and their solution methods, skills in computer programing as well as in use of commercial software packages, and techniques in modeling and simulation of practical engineering problems using the FEM.

16. 预达学习成果 Learning Outcomes

本课程预期达到的学习成果包括：学生应了解有限元法的理论基础、弹性力学 2D/3D 问题单元建立过程、方程组装和求解方法、及有限元计算机编程能力；熟练使用至少一个商用有限元软件、并能正确使用有限元建模分析实际工程问题。了解其它固体力学中的计算方法，如无网格方法、边界元方法等。

The course will enable students to understand the theoretical foundation, element formulation, computer programing, and software applications of the FEM in solving 2D/3D elastostatic and dynamic problems. They will be able to model and simulate practical design problems in aerospace, mechanical, and civil engineering using the FEM. They shall also understand other methods in computational solid mechanics, such as meshfree methods and the boundary element method.

17. 课程内容及教学日历 （如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）
Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Section 1: Introduction of the FEM and its applications in engineering (2 credit hours)

Section 2: Bar element and truss analysis (4 credit hours)

Section 3: Beam element and frame analysis (2 credit hours)

Section 4: Introduction to ANSYS Classic/Workbench (4 credit hours)

Section 5: Basic element formulations; Interpolations (2 credit hours)

Section 6: Variational methods (4 credit hours)

Section 7: Galerkin and other weighted-residual methods (2 credit hours)

Section 8: Isoparametric elements and computer programing of the FEM (4 credit hours)

Section 9: 2-D/3-D elements for elasticity problems (2 credit hours)

Section 10: Use of ANSYS in solving 2-D/3D elastostatic problems (4 credit hours)

Section 11: Errors in FEM and error estimates; Modeling techniques (2 credit hours)

Section 12: FEM in vibration analysis (4 credit hours)

Section 13: FEM in frequency response analysis (2 credit hours)

Section 14: Use of ANSYS in solving dynamic problems (4 credit hours)

Section 15: Meshfree methods and the boundary element method (2 credit hours)

Section 16: Presentations of final projects (4 credit hours)

18. 教材及其它参考资料 Textbook and Supplementary Readings

1. The Finite Element Method: Its Basis and Fundamentals, by O. C. Zienkiewicz, R. L. Taylor, and J.Z. Zhu, 6th edition, Elsevier, 2005 (PDF copy).
2. 有限单元法，王勖成编著，清华大学出版社，2003.
3. Finite Element Modeling and Simulation with ANSYS Workbench, by Xiaolin Chen and Yijun Liu, CRC Press, 2014 (PDF Lecture slides).

课程评估 ASSESSMENT

19.

评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance				
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects		15	抄袭本项记 0 分 Cheating:0	
平时作业 Assignments		15	抄袭平时作业记 0 分 Cheating:0	
期中考试 Mid-Term Test		30	考试作弊本门课程记 0 分 Cheating:0	
期末考试 Final Exam				
期末报告 Final Presentation		40	考试作弊本门课程记 0 分 Cheating:0	
其它（可根据需要改写以上评估方式）				

Others (The above may be modified as necessary)				

20. 记分方式 **GRADING SYSTEM**

☑ A. 十三级等级制 **Letter Grading**
☐ B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. **本课程设置已经过以下责任人/委员会审议通过**
This Course has been approved by the following person or committee of authority

力学与航空航天工程系教学指导委员会
The commission of teaching instruction in department of mechanics and aerospace engineering