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**	连续介质力学基础 Fundamentals of Continuum Mechanics
2.	**授课院系 Originating Department**	地球与空间科学系 Department of Earth and Space Sciences
3.	**课程编号 Course Code**	ESS312
4.	**课程学分 Credit Value**	4
5.	**课程类别 Course Type**	专业基础课 Major Basic Courses
6.	**授课学期 Semester**	春季 Spring
7.	**授课语言 Teaching Language**	中英双语 English & Chinese
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）**	方鑫定，地球与空间科学系 邮箱：fangxd@sustech.edu.cn 电话：0755-88018795 办公室：创园 9 栋 311 Xinding Fang, Department of Earth and Space Sciences Email: fangxd@sustech.edu.cn Tel: 0755-88018795 Office: Innovation Park #9-311
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	64				64

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MA101B 高等数学（上）A 、MA103A 线性代数 I-A MA101B Calculus I A and MA103A Linear Algebra I-A
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

本课程为地球物理学和空间物理学本科生专业基础课。本课程主要讲述连续介质力学的基本理论，为后续专业课程（例如地震学、地球物理反演、地震勘探和岩石力学等）的学习准备必要的理论知识。

This is a major foundational course for undergraduate students in Geophysics and Space Physics. This course aims to teach the fundamental theory of continuum mechanics and prepare students for study of the major core courses of ESS.

16. 预达学习成果 Learning Outcomes

学生完成本课程后，将会掌握以下知识：

1. 理解应力应变的物理含义，能够计算主应力和应力张量不变量；
2. 理解弹性参数的物理含义，能够利用胡克定律进行简单的应力应变分析；
3. 了解定义一个完整的弹性静力学问题所需的方程和边界条件，以及这类问题的一般求解方法；
4. 掌握流体力学的基本概念和基本控制方程。

Upon completing the course, students will:

1. Understand the physical meaning of stress and strain and can calculate principal stresses and stress invariants;
2. Understand the physical meaning of elastic moduli and can perform some basic stress-strain analysis based on Hooke's law;
3. Know how to write down the system of equations for a static equilibrium problem and the general methods for solving it;
4. Understand the basic concepts and governing equations in fluid mechanics.

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.)

第一章 绪论（1 学时）
本章为连续介质力学的理论发展和应用介绍。

第二章 应力分析（10 学时）
本章介绍应力定义、主应力计算、应力不变量、应力莫尔圆和静力平衡方程。

第三章 应变分析（6 学时）
本章介绍应变定义、正应变、剪应变和应变协调方程。

第四章 应力应变关系（6 学时）
本章介绍广义胡克定律和不同弹性参数的定义和物理意义。

第五章 弹性力学定解问题（12 学时）
本章介绍弹性静力学问题的控制方程组和一般的求解方法。

第六章 平面弹性问题（10 学时）
本章介绍平面应变和平面应力问题的求解方法。

第七章 张量分析（8 学时）
本章介绍并矢和张量的定义，以及张量运算的规则和技巧。

第八章 流体力学简介（11 学时）
本章介绍理想流体静力学和动力学的基本概念和控制方程组。

Chapter 1 Introduction (1 hours)
This section gives an overview of the theory and applications of continuum mechanics.

Chapter 2 Stress Analysis (10 hours)
This section introduces the Euler-Cauchy stress principle, calculation of principal stresses, stress invariants, Mohr's Circle, and static equilibrium equations.

Chapter 3 Strain Analysis (6 hours)
This section introduces the strain definition, meaning of normal strain and shear strain, and strain compatibility equations.

Chapter 4 Stress-strain relations (6 hours)
This section introduces the generalized Hooke's law and the definition of different elastic constants.

Chapter 5 Formulation of problems in elasticity (12 hours)
This section discusses the general formalism of a static equilibrium problem and the procedures for deriving a static solution.

Chapter 6 Two-dimensional problems (10 hours)
This section discusses the plane stress and plane strain problems.

Chapter 7 Tensor Analysis (8 hours)
This section introduces the definition of dyadic, the principles of tensor algebra and the mathematical skills used in tensor analysis.

Chapter 8 Fluid mechanics (11 hours)
This section introduces the basic concepts and governing equations in fluid mechanics and the theory of perfect fluid.

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

1. Elasticity - Tensor, Dyadic & Engineering Approaches: Pei Chi Chou and Nicholas J. Pagano, Dover Publications Inc., 1992.
2. 流体力学，张志宏,顾建农，科学出版社，2015.

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		10		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		20		
期中考试 Mid-Term Test		30		
期末考试 Final Exam		40		
期末报告 Final Presentation				
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**

南方科技大学
SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

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
