

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	固体地球物理学原理 Principles of Geophysics
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	ESS209
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	秋季 Fall
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)	徐世庆, 地球与空间科学系 邮箱: xusq3@sustech.edu.cn 电话: 0755-88018653 办公室: 创园9栋310室 Shiqing Xu, Department of Earth and Space Sciences Email: xusq3@sustech.edu.cn Tel: 0755-88018653 Office: Innovation Park #9-310
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				48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MA101B 高等数学上 A MA101B Calculus 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

本课程主要介绍关于固体地球物理学的基本理论和研究方法。教授内容涵盖了地球的结构，力学，电磁学，热力学等特征。其主要目标是帮助学生进一步了解固体地球物理，为之后的专业学习打好基础。

This course mainly introduces the basic principles and methods of geophysics. The contents include the structural, mechanical, electromagnetic, and thermal properties of the Earth. This course will help the students gain a deeper understanding of the solid earth, and will provide the basics for future studies of geophysics.

16. 预达学习成果 Learning Outcomes

通过学习本门课程，预计学生将收获以下成果：

1. 掌握有关地球的基本常识；
2. 熟悉板块构造的运动学和动力学特征；
3. 了解研究固体地球物理学的相关方法和思想；
4. 学会一些处理固体地球物理问题的技巧。

Through this course, the students will:

1. Master the basic fundamentals of the Earth;
2. Be familiar with the kinematics and dynamics of plate tectonics;
3. Know the basic methods and ideas for studying geophysics;
4. Learn some skills for solving geophysical problems.

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：引言（2 学时）

课程简介，目标和评估方法介绍，固体地球物理学综述

第二章：行星角度看地球（2 学时）

地球和其所处的太阳系

第三章：地球的结构和物理属性（12 学时）

地球的重力场和形状，地球年龄和地热，地电，地磁，地震波，地球内部结构

第四章：地球的演化（6 学时）

板块构造理论的提出和支持证据

期中考试（2 学时）

第五章：地球观测（6 学时）

观测技术，测量原理，地球物理信号处理，数据解释

第六章：物理模拟和数值模拟（10 学时）

量纲分析，几种常见的地球物理实验，数值模拟的思想，几种常用的数值模拟方法，数值模拟在若干地球物理问题上的应用

第七章：正演和反演（4 学时）

正演和反演的思想，在地球物理领域中的应用

第八章：前沿技术应用（4 学时）

人工智能，大数据，机器学习

期末考试

Chapter 1: Introduction (2 hours)

Introduction to the course contents, goals, evaluation; a brief overview of geophysics

Chapter 2: The Earth as a planet (2 hours)

The Earth and the solar system

Chapter 3: The structure and physical properties of the Earth (12 hours)

The Earth's gravity and shape, the Earth's age and heat, geoelectricity, geomagnetism, seismic waves, the internal structure of the Earth

Chapter 4: Evolution of the Earth (6 hours)

The establishment of the theory of plate tectonics and the related supporting evidences

Mid-term exam (2 hours)

Chapter 5: Earth observation (6 hours)

Observational techniques, measuring principle, geophysical signal processing, data interpretation

Chapter 6: Physical and numerical modeling (10 hours)

Scaling analysis, some geophysical experiments, ideas of numerical modeling, some methods for performing numerical modelling, application of numerical modeling in some geophysical problems

Chapter 7: Forward and inverse modeling (4 hours)

Basic ideas of forward and inverse modeling, application in geophysics

Chapter 8: Application of cutting-edge techniques (4 hours)

Artificial intelligence, big data, and machine learning

Final exam

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

1. Fundamentals of Geophysics, 2nd edition, W. Lowrie, Cambridge University Press, 2007.
2. The Solid Earth: An Introduction to Global Geophysics, 2nd edition, C. M. R. Fowler, Cambridge University Press, 2005.
3. Geodynamics, 3rd edition, Turcotte, D., and Schubert, D., Cambridge University Press, 2014.
4. Numerical recipes: The art of scientific computing, 3rd edition, W. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, Cambridge University Press, 2007.

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		10		
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		15		
期中考试 Mid-Term Test		25		
期末考试 Final Exam		50		
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

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

地球与空间科学系本科教学指导委员会