

## 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.	<b>课程名称 Course Title</b>	应用地球物理学原理 Principles of Applied Geophysics
2.	<b>授课院系 Originating Department</b>	地球与空间科学系 Department of Earth and Space Sciences
3.	<b>课程编号 Course Code</b>	ESS214
4.	<b>课程学分 Credit Value</b>	3
5.	<b>课程类别 Course Type</b>	专业核心课 Major Core Courses
6.	<b>授课学期 Semester</b>	春季 Spring
7.	<b>授课语言 Teaching Language</b>	英语 English
8.	<b>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 &amp; Contact (For team teaching, please list all instructors)</b>	杨迪琨, 地球与空间科学系 邮箱: yangdk@sustech.edu.cn 电话: 0755-88018695 办公室: 理学院 E4143  Dikun Yang, Department of Earth and Space Sciences Email: yangdk@sustech.edu.cn Tel: 0755-88018695 Office: College of Science E4143
9.	<b>实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact</b>	待公布 To be announced
10.	<b>选课人数限额(可不填) Maximum Enrolment (Optional)</b>	

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
	48	0	0	0	48
学时数 Credit Hours					
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无 None				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 None				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 None				

### 教学大纲及教学日历 SYLLABUS

#### 15. 教学目标 Course Objectives

本课程介绍如何通过激发和观测地球重力场、磁场、电场、机械波场等物理场来推断不同尺度下的地球内部结构，并为油气勘探、矿产普查和环境调查等问题提供重要依据。

This course introduces how the vast interior of the earth at different scales can be imaged by exciting and observing the gravitational field, the magnetic field and the electrical field on the surface and inside the earth. Such technology has wide application in oil/gas exploration, mineral exploration and environmental investigation.

#### 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. 地球介质的密度属性和重力异常探测；
2. 地球介质的磁化率属性，感应磁化和剩磁现象及磁法探测；
3. 地球介质的电阻率属性和直流电阻率探测方法；
4. 地球介质在交变电磁场激发下的响应及电磁感应探测方法；
5. 地球介质中的机械波传播现象与使用地震波探测地球内部结构的方法；
6. 井中物理，包括电测井、声波测井、放射性测井等方法；
7. 重力、磁法、电法、地震、测井等探测方法在资源环境、工程勘察等领域的应用。

Upon completing the course, students will master the following knowledge:

1. The density of the earth medium and detection of gravity anomaly;
2. The magnetic susceptibility of the earth medium, induced magnetization, remnant magnetization and magnetic exploration method;
3. The electrical conductivity of the earth medium and dc resistivity (ERT) method;
4. The response of the earth medium excited by alternating electromagnetic sources and EM induction exploration method;
5. The wave phenomena in the earth medium and seismic exploration for the internal structure of the earth;
6. Borehole geophysical, including electrical, acoustic and radioactive well logging;
7. Application of gravity, magnetic, electrical, seismic and well logging methods in the exploration of resource, environment, and engineering.

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.)**

**Chapter 1: Introduction (2 hours)**

Concept of physical properties of the earth, scale of investigation, application of geophysical exploration

**Chapter 2: Gravity method (6 hours)**

Density, gravity anomaly of geological objects, gravimeter, gravity gradiometry, correction of gravity data, gravity data modelling and inversion, survey method and instruments

**Chapter 3: Magnetic method (6 hours)**

Magnetic susceptibility, induced and remnant magnetization, earth's magnetic field, magnetometer, magnetic data modelling and inversion, survey method and instruments

**Chapter 4: Electrical method (6 hours)**

Electrical resistivity, electrostatic problem and solution, ERT survey method, induced polarization, data modelling and inversion, survey method and instruments

**Chapter 5: Electromagnetic method (10 hours)**

EM induction and radar, frequency and time domain methods, magnetotelluric, airborne EM, surface/borehole method, marine EM, EM data modelling and inversion, survey method and instruments

**Chapter 6: Seismic method (16 hours)**

Wave propagation in the subsurface, seismic survey, seismic data processing, migration and inversion, near surface seismology, velocity estimation.

**Chapter 7: Geophysical well logging (2 hours)**

Electrical, induction, acoustic and radioactive well logging, geophysical source and receivers in boreholes, well logging instruments

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

参考资料:

Telford, W.M., Geldart L.P., Sheriff, R.E., and Keys, D.A. (1976), Applied geophysics, Cambridge University Press.

**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		20		
期中考试 Mid-Term Test		20		
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

地球与空间科学系科教学指导委员  
Undergraduate Teaching Steering Committee of Department of Earth and Space Sciences