

## 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 II (重磁电探测方法及测井) Applied Geophysics II (Gravity & EM Exploartion and Well Logging)
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>	ESS302
4.	<b>课程学分 Credit Value</b>	3
5.	<b>课程类别 Course Type</b>	专业选修课 Major Elective 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>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	杨迪琨, 地球与空间科学系 邮箱: yangdk@sustech.edu.cn 电话: 0755-88018695 办公室: 创园 9 栋 406B Dikun Yang, Department of Earth and Space Sciences Email: yangdk@sustech.edu.cn Tel: 0755-88018695 Office: Innovation Park #9-406B
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	习题/辅导/讨论	实验/实习	其它(请具体注明)	总学时
	Lectures	Tutorials	Lab/Practical	Other (Please specify)	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、PHY105B 大学物理(下)B MA101B Calculus I A and PHY105B General Physics B (II)				
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

本课程介绍如何通过激发和观测地球重力场、磁场、电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. 地球物理测井，包括电测井、声波测井、放射性测井等；
6. 重磁电测探测方法应用。

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 an alternating electromagnetic field and EM exploration method;
5. Geophysical well logging: electrical, acoustic and radioactive;
6. Application of gravity, magnetic, electrical and well logging methods.

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 survey (6 hours)**

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

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

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

**Chapter 4: Electrical resistivity tomography (6 hours)**

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

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

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

**Chapter 6: Geophysical well logging (6 hours)**

Electrical, induction, acoustic and radioactive well logging, application of well logging in oil/gas industry

**Chapter 7: Geophysical inversion (4 hours)**

Data processing, data uncertainty, numerical modelling and imaging

**Chapter 8: Integrated geophysical approach (8 hours)**

Case studies in groundwater exploration, mineral exploration, hydrocarbon exploration, environment problems, joint inversion

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		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

**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