

课程大纲 COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	空间探测原理和技术/ Experimental Methods in Space Science
2.	课程性质 Compulsory/Elective	专业必修/major compulsory
3.	课程学分/学时 Course Credit/Hours	3 学分/64 学时 3credit /64 hours
4.	授课语言 Teaching Language	英语 English
5.	授课教师 Instructor(s)	叶生毅 YE Shengyi
6.	是否面向本科生开放 Open to undergraduates or not	否
7.	先修要求 Pre-requisites	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)
8.	教学目标 Course Objectives	<p>(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)</p> <p>本课程主要介绍空间科学中常用的探测仪器及探测技术原理, 结合近年来的一些空间探测任务数据介绍数据的获取、处理及分析的方法。实验课提供一些常用探测仪器的操作实践机会, 巩固加深对理论课介绍内容的理解。</p> <p>This course is an introduction the measurement techniques commonly used in space science. Based on examples of recent space missions, the methods of data acquisition, processing, and analysis will be introduced. The laboratory exercises provide opportunities for hands-on operation of the instruments commonly used in space exploration, consolidating the principles introduced in lectures.</p>
9.	教学方法 Teaching Methods	<p>(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)</p> <p>理论课与实验课结合</p>
10.	教学内容 Course Contents	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)
	Section 1	课程简介和空间探测背景介绍 Introduction to space exploration: history and background (2 学时)
	Section 2	电磁场探测 Electromagnetic field detection (4 学时, 另加实验 4 学时) 磁通门磁强计、探测线圈磁强计、双探针电场测量、电子漂移技术、电磁波动探测、飞船电势测量等

	Fluxgate magnetometer, search coil magnetometer, double probe electric field measurement, electron drift technique, electromagnetic waves measurement, spacecraft potential measurement, etc.
Section 3	<p>质谱仪与带电粒子探测 Mass spectrometer and charged particle detectors (4 学时, 另加实验 4 学时)</p> <p>射频质谱仪、飞行时间质谱仪、减速电势分析仪、低能带电粒子探测等</p> <p>Radio frequency mass spectrometer, Time-of-flight mass spectrometer, retarding potential analyzer, low energy particle detector, etc.</p>
Section 4	<p>高能中性原子探测 Energetic Neutral Atoms (2 学时、另加实验 2 学时)</p> <p>高能中性原子成像原理、卡西尼磁层成像仪、星际边界探测器等</p> <p>Energetic neutral atom imaging, Cassini Magnetospheric Imaging Instrument (MIMI), Interstellar Boundary Explorer (IBEX) mission, etc.</p>
Section 5	<p>粒子辐射探测 Cosmic rays and radiations (2 学时)</p> <p>高能粒子探测、空间 X 射线、伽马射线探测等</p> <p>Energetic particles detection, X-ray and Gamma ray detection in space, etc.</p>
Section 6	<p>尘埃探测 Cosmic dust detection (2 学时、另加实验 2 学时)</p> <p>宇宙尘埃探测方法、宇宙尘埃组分测定、宇宙尘埃密度及尺寸分布等</p> <p>Detection methods for cosmic dust, measuring the constituents of cosmic dust, size and density distribution of cosmic dust, etc.</p>
Section 7	<p>光谱仪 Optical spectrometer (2 学时、另加实验 2 学时)</p> <p>光谱仪的基本构成和指标、光栅光谱仪、晶体光谱仪等</p> <p>Basic components and parameters of optical spectrometer, grating spectrometer, crystal spectrometer, etc.</p>
Section 8	<p>光学遥感. Optical remote sensing (2 学时、另加实验 4 学时)</p> <p>望远镜、红外遥感、紫外遥感、激光雷达等</p> <p>Telescope, infrared remote sensing, ultraviolet remote sensing, LIDAR, etc.</p>
Section 9	<p>电离层遥感与就位探测 Ionosphere remote sensing and in-situ measurement (4 学时、另加实验 4 学时)</p> <p>相干散射雷达、非相干散射雷达、电离层测高仪、朗缪尔探针等</p> <p>Coherent scatter radar, incoherent scatter radar, ionosonde, Langmuir probe, etc.</p>

<p>Section 10</p>	<p>磁层探测 Magnetosphere observation (2 学时、另加实验 2 学时)</p> <p>磁层与电离层中的电场探测、等离子体波探测、磁层整体成像技术等</p> <p>Electric field measurement in magnetosphere and ionosphere, plasma wave detection, magnetospheric imaging technique, etc.</p>
<p>Section 11</p>	<p>太阳观测 Solar observation (2 学时、另加实验 4 学时)</p> <p>日震技术、日冕观测、太阳耀斑观测、太阳磁场测量等</p> <p>Helioseismology, solar corona observation, solar flare observation, measurement of the solar magnetic field, etc.</p>
<p>Section 12</p>	<p>太阳系探测 Exploration of the solar system (2 学时、另加实验 4 学时)</p> <p>类地行星探测、巨行星探测、彗星及小行星探测等</p> <p>Terrestrial planets exploration, giant planets exploration, comets and asteroids exploration, etc.</p>
<p>Section 13</p>	<p>星际空间与系外行星探测 Interstellar space and exoplanets detection (2 学时)</p> <p>日球层边界探测、行星际空间探测、系外行星探测等</p> <p>Detection of the heliosphere boundary, measurements in the interstellar space, exoplanets detection, etc.</p>
<p>11. 课程考核 Course Assessment</p>	
<p>(① 考核形式 Form of examination; ②. 分数构成 grading policy; ③ 如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)</p> <p>平时课堂表现 10% 实验报告 30% 期中报告 30% 期末报告 30%</p>	
<p>12. 教材及其它参考资料 Textbook and Supplementary Readings</p>	
<p>1. 焦维新, 空间探测, 北京大学出版社, 2002 2. Measurement techniques in solar and space physics, JGR special issue, 2017</p>	