

物理实验（2）课程教学大纲

课程基本信息（Course Information）					
课程代码 （Course Code）	PH204	学时 （Credit Hours）	48	学分 （Credits）	3
课程名称 （Course Name）	物理实验（2）				
	Physics Lab II				
课程性质 (Course Type)	专业实践类必修课程 Training Course				
授课对象 （Audience）	物理学专业、应用物理学专业大学二年级本科生				
授课语言 (Language of Instruction)	中文、英文 Chinese, English				
开课院系 （School）	物理与天文学院 Department of Physics and Astronomy				
先修课程 （Prerequisite）	物理实验（1） Physics Experiment (1)				
授课教师 （Teacher）	王锦辉、周红、胡晓、潘葳、 马杰		课程网址 (Course Webpage)	http://pec.sjtu.edu.cn	
*课程简介 （Description）	<p>本课程先修课程为物理实验（1）。课时为 48 学时，3 学分。授课对象为物理系标准班和国际班学生。本课程包含有六个实验项目，分别是“光栅特性研究”、“迈克尔逊干涉仪的调整与使用”、“平衡与非平衡电桥的应用”、“RLC 电路特性研究”、“硅光电池和太阳电池应用”以及“磁性材料特性研究”。每个实验项目 8 学时，分 2 次上课，每次 4 学时。</p> <p>本课程涵盖了电学、光学及磁学中一些重要内容，深度和广度较先修课程增加，为综合设计性课程。后续课程为物理实验（3）。</p> <p>本课程的目标：通过本课程的学习，学生将会进行实验方法设计，综合运用实验装置进行实验数据的采集，并能深入地处理和分析数据。通过该课程进一步培养学生的动手能力和科学研究能力。</p>				
*课程简介 （Description）	<p>Credit/Class hour: 3/48</p> <p>Physical Experiment II is the second comprehensive course after Physical Experiment I , and intended for standard and international classes in physical department of SJTU.</p> <p>The course consists of 6 experiments. Each experiment should be completed in two weeks. 4 class hours per week. Experiments are mainly chosen in the area of electricity, optic and magnetism. Students are expected to learn how to design an</p>				

	experiment and obtain relevant data using given devices. Meanwhile, they are required to master how to process and analyze experimental data.					
	List of experiments Lab 1. Properties of the Optical Grating Lab 2. Practice and Application of Michelson Interferometer Lab 3. Application of Balanced and Non-balanced Wheatstone Bridges Lab 4. RLC Circuits Lab 5. Properties of Silicon Photocell and Solar Cell Lab 6. Investigation of the Properties of Magnetic Material					
课程教学大纲（course syllabus）						
*学习目标 (Learning Outcomes)	1. 针对实验要求，对实验进行综合设计 2. 利用 Origin 等数据处理工具分析实验数据，撰写合格的实验报告 3、进一步进行科研能力训练 1. Systematically design the experiment according to the experiment requirement 2. Analyze the experimental data by data processing tools such as origin. Write experiment report. 3. Further train the science ability of the students.					
*教学内容、进度 安排及要求 (Class Schedule &Requirements)	教学内容 Content	学时 Hours	教学方式 Teaching Method	作业及要求 Homework	基本要求 Essential Requirements	考查方式 Testing Method
	光栅特性研究 Study on the properties of optical grating	8	实验指导 Experiment Guidance	计算三棱镜顶角并计算不确定度,用已知绿光波长计算光栅常数并以此计算汞灯其它谱线的波长,钠光双黄线的波长差。 Calculate the corner angle of the prism and its uncertainty. Calculate the grating constant of the grating by the known wavelength of green light and therefore the wavelength of other spectral lines of the Mercury lamp, as well as the wavelength difference of Na	掌握分光计的调整与使用方法,反射法测量三棱镜顶角,利用最小偏向角测棱镜的折射率。测量光栅特性参数及汞灯和钠灯光谱波长。 Learn to adjust and use the spectrometer. Measure the corner angle of the prism by the reflection method. Measure the refraction index by the angle of	预习+操作+实验报告 Preview+operation+report

				yellow lines.	minimum deviation. Measure the characteristic parameters of the grating and the wavelength of the spectral lines of Hg and Na lamps.	
	迈克尔逊干涉仪的调整与使用 Adjustment Of Michelson Interferometer	8	实验指导 Experiment Guidance	利用逐差法计算钠光的平均波长, 计算钠双线的波长差 Calculate the average and difference of wavelength of the Na yellow light.	掌握迈克尔逊干涉仪的调整与使用方法, 测量钠光的平均波长和波长差, 观察白光干涉和激光非定域干涉 Learn to adjust and use the Michelson interferometer. Measure the mean and difference of wavelength of Na yellow lines. Observe the interference of white light and non-localized interference of laser.	预习+操作+实验报告 Preview+operation+report
	平衡与非平衡电桥的应用 Application of the equilibrium and non-equilibrium bridges	8	实验指导 Experiment Guidance	计算三个待测电阻及其不确定度, 利用Origin 拟合铂电阻和热敏电阻温度特性并求出特性参数 Calculate the value of three sample resistance and their uncertainty. Fit the	利用平衡电桥测量三个待电阻, 设计利用非平衡电桥测量铂电阻和热敏电阻传感器随温度变化特性, 设计利用电阻应变片测	预习+操作+实验报告 Preview+operation+report

				curve of the temperature characteristics of Pt resistor and thermal resistor	量应变。 Measure the three sample resistors by equilibrium bridge. Design the experiment to measure the temperature characteristics of Pt resistor and thermal resistor. Design the experiment to measure the strain by resistive strain gauge.	
	RLC 电路特性研究 Study of the properties of RLC circuits	8	实验指导 Experiment Guidance	多种方法计算 RC,RL,RLC 暂态过程中的时间常数,得出欠阻尼、临界阻尼和过阻尼不同的实验条件。得到 RC,RL,RLC 串联电路的幅频特性和相频特性曲线,计算谐振电路中的品质因子和共振频率 Calculate the time constant in the transient state of RC, RL and RLC circuits by various methods. Investigate the experimental conditions of under damping, critical damping and overdamping. Measure the amplitude-frequency	熟练使用数字存储示波器。搭建 RC,RL,RLC 串联电路,研究其暂态特性、稳态特性和谐振特性。 Master the use of digital oscilloscope. Build RC, RL and RLC circuits and study their transient and steady state properties.	预习+操作+实验报告 Preview+operation+report

				and phas-frequency Curves of RC, RL and RLC circuits. Calculate the resonance frequency and Q factor of the resonant circuit.		
	硅光电池和太阳电池应用 Application of the Si photocell and solar cell	8	实验指导 Experiment Guidance	<p>硅光电池的开路电压和短路电流随照度变化,无偏和反偏条件下伏安特性曲线。太阳电池的伏安特性曲线及最大功率、填充因子等参数计算。</p> <p>Measure the relationship of the open-circuit voltage and short-circuit current of Si photocell with the intensity of illumination. Measure its I-V characteristics under non-bias and reverse-bias situations. Measure the I-V characteristics , maximum output power, fill factor and conversion efficiency etc. of Si solar cell.</p>	<p>了解光伏效应原理,测量硅光电池和太阳电池的伏安特性,太阳电池特性参数计算。</p> <p>Learn the principle of photovoltaic effect. Measure the I-V characteristics of Si photocell and solar cell. Calculate the typical parameters of solar cells.</p>	<p>预习+操作+实验报告</p> <p>Preview+operation+report</p>
	磁性材料特性研究 Study of the properties of magnetic materisl	8	实验指导 Experiment Guidance	<p>利用 Origin 作出磁滞回线,得出矫顽力等磁性参数,得到磁性材料的居里温度。Draw the hysteresis curve of magnetic material. Obtain the magnetic parameters (coercive force etc.) and Curie</p>	<p>设计合适的测量电路,利用示波器观察并记录磁滞回线,利用交流电桥测定材料的居里温度。Design suitable measuring circuits.</p>	<p>预习+操作+实验报告</p> <p>Preview+operation+report</p>

				temperature.	Observe the hysteresis curves by oscilloscope. Measure the Curie temperature by AC bridge.	
*考核方式 (Grading)	各实验项目的平均。每个实验项目评分由预习、操作、实验报告三部分组成，其中预习 10 分、操作 40 分，报告 50 分 Weighted mean of all issues including preview, operation and report, corresponding to 10, 40, and 50 points, respectively					
*教材或参考资料 (Textbooks & Other Materials)	物理实验（2）讲义 Lecture notes for Physics Experiment (2)					
其它 (More)	无					
备注 (Notes)	考核方式及考核方式中各项比例根据教学实践可能有所调整。					