

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	电动力学 II Electrodynamics II				
2.	授课院系 Originating Department	物理系 Department of Physics				
3.	课程编号 Course Code	PHY208				
4.	课程学分 Credit Value	3				
5.	课程类别 Course Type	专业基础课 Major Foundational Courses				
6.	授课学期 Semester	春季 Spring				
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)	叶飞, 教学教授, 物理系 第二科研楼 228 室 YE Fei, 电话: 88018229				
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		0	考试周不算入总学时	48

<p>12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements</p>	<p>电动力学 I (PHY207-15) Electrodynamics I (PHY207-15)</p>
<p>13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite</p>	<p>量子场论, 以及其它相关课程。 Quantum Field Theory, and other related courses.</p>
<p>14. 其它要求修读本课程的学系 Cross-listing Dept.</p>	<p>此课程适合需要电动力学和相对论等基础知识的相关专业学生学习。 For other majors requiring the fundamentals of electrodynamics and relativity.</p>

教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

本课程为电动力学 I 的后续课程, 主要讲授守恒定律, 电磁场的能量、动量和角动量, 电磁波在介质中的传播, 电磁势和规范理论, 运动电荷的电磁势场, 电磁辐射的产生机制, 狭义相对论及其应用。

This course is the subsequent course of Electrodynamics I. In this course, we introduce the conservation law; the energy, momentum, angular momentum of electromagnetic field; the propagation of the electromagnetic wave in various media; the electromagnetic potentials and gauge theory; the electromagnetic field of moving charges; the mechanism of radiation; the principle of special relativity and its application.

16. **预达学习成果 Learning Outcomes**

学生修完本课程, 能够利用电动力学基本规律和 Maxwell 方程组来分析、处理各种电磁学现象, 包括反射、折射、色散、波导、辐射等; 掌握电磁场的能量、动量和角动量的概念, 并理解其物理后果; 理解规范不变性及其深刻影响; 理解相对论的时空观, 及其在电磁理论中的重要作用。

After passing this course, the students should be able to apply the fundamental laws of electrodynamics to analyze various electromagnetic phenomena including reflection, refraction, dispersion, waveguide, radiation etc. Understand the concept of the energy, momentum and angular momentum of the electromagnetic field, the gauge invariance of electrodynamics and its deep impact in physics, special relativity of spacetime and its important role in electrodynamics.

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.)

1、守恒律

周 1: 连续性方程, 玻印廷定理, 电动力学中的牛顿第三定律。

周 2: 麦克斯韦应力张量, 动量和角动量的守恒律。

2、电磁波

周 3: 一维波的性质, 真空中的电磁波。

周 4: 介质中的电磁波。

周 5: 电磁波的吸收和色散。

周 6: 波导。

3、电磁势和电磁场

周 7: 标量势和矢量势, 规范变换。

周 8: 规范不变性, AB 效应, 螺线管和磁单极子的矢量势。

周 9: 库伦规范和洛伦兹规范, 推迟势, Jefimenko 方程。

周 10: 点电荷, Lienard-Wiechert 势, 运动点电荷的场。

周 11: 期中考试。

4、辐射

周 12: 偶极辐射。

周 13: 点电荷的辐射。

5、电动力学和相对论

周 14: 狭义相对论。

周 15: 相对论力学。

周 16: 相对论电动力学及其它。

1、Conservation Laws (week 1-2)

Week 1: The Continuity Equation, Poynting's Theorem, Newton's Third Law in Electrodynamics,

Week 2: Maxwell's Stress Tensor, Conservation of Momentum, Angular Momentum,

2、Electromagnetic Waves

Week 3: The properties of Waves in One Dimension, Electromagnetic Waves in Vacuum,

Week 4: Electromagnetic Waves in Matter,



Week 5: Absorption and Dispersion,
 Week 6: Guided Waves
 3、 Potentials and Fields
 Week 7: Scalar and Vector Potentials, Gauge Transformations,
 Week 8: Gauge invariance, AB effect, Vector potential of a thin solenoid and magnetic monopole
 Week 9: Coulomb Gauge and Lorentz Gauge, Retarded Potentials, Jefimenko's Equations,
 Week 10: Point Charges, Lienard-Wiechert Potentials, The Fields of a Moving Point Charge,
 Around Week 11: Midterm examination.
 4、 Radiation
 Week 12: Dipole Radiation,
 Week 13: Radiation of Point Charges
 5、 Electrodynamics and Relativity
 Week 14: The Special Theory of Relativity,
 Week 15: Relativistic Mechanics,
 Week 16: Relativistic Electrodynamics, and others.

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

教材：
 Introduction to Electrodynamics, David J. Griffiths, 世界图书出版社
 参考资料：
 1、 Classical Electrodynamics, J. D. Jackson, Wiley
 2、 电动力学，虞福春，北京大学出版社

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				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		40%		
期中考试	2 小时	30%		

Mid-Term Test	2 hours			
期末考试	2 小时	30%		
Final Exam	2 hours			
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)		可根据需要改写以上评估方式 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

物理系教学指导委员会
 Education Instruction Committee of Physics department

