

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	自由电子激光引论 Introduction to free-electron laser
2.	授课院系 Originating Department	物理系 Department of Physics
3.	课程编号 Course Code	PHYS301
4.	课程学分 Credit Value	1
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	夏季 Summer
7.	授课语言 Teaching Language	中文 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)	王晓凡 先进光源科学中心 Xiaofan Wang, Center for Advanced Light Source wangxf@mail.iasf.ac.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	无 NA
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	16	0	0	0	16
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无 NA				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 NA				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 NA				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

自由电子激光是最先进的加速器光源之一。本课程将教授自由电子激光基本原理，介绍束流动力学基础、低增益和高增益理论、自由电子激光工作模式和实验结果、未来发展等基本概念。

Free electron laser is one of the most advanced accelerator-based light sources. This course will teach the basic principles of free electron lasers and introduce the fundamental concepts of beam dynamics, low-gain and high-gain theory, operating modes and experimental results, and future developments.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，学生应对自由电子激光的模式和原理有基本的了解，对自由电子激光的现状和未来发展有清晰的认识。

After completion of this course, students should have a basic understanding of the mode and principle of free electron laser, and have a clear understanding of the current situation and future development of free electron laser.

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.)

本课程将分为八讲，具体内容如下。

This course consists of eight lectures.

第一讲：自由电子激光简介

Lecture 1: Introduction and overview of free-electron laser

第二讲：束流动力学基础

Lecture 2: Basic of particle dynamics

第三讲：自由电子激光辐射

Lecture 3: Undulator radiation

第四讲：低增益自由电子激光

Lecture 4: Low-gain theory

第五讲：高增益自由电子激光

Lecture 5: High-gain theory

第六讲：自由电子激光工作模式

Lecture 6: Operating mode of free-electron laser

第七讲：自由电子激光技术实现和实验结果

Lecture 7: Technical Realization and Experimental Results

第八讲：自由电子激光未来发展

Lecture 8: Future plans of free-electron laser

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

教材：

Schmüser, Peter, et al. "Free-electron lasers in the ultraviolet and X-ray regime." Springer Tracts in Modern Physics 258, 2014.

参考资料：

赵振堂 等，先进 X 射线光源加速器原理与关键技术，上海交通大学出版社，2020 年第一版

Zhentang Zhao et al., Principles and Key Technologies of Advanced X-ray Light Source Accelerators, Shanghai Jiao Tong University Press, 2020 first edition.

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		20		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				

平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		80		围绕国外任一自由电子激光装置，完成装置调研报告 Complete a research report of any foreign free-electron laser facilities
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

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