课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	**高级微纳光学** **Advanced Nano-Optics**
2.	**课程性质** **Compulsory/Elective**	选修课 Elective
3.	**课程学分/学时** **Course Credit/Hours**	3/48
4.	**授课语言** **Teaching Language**	英文 English
5.	**授课教师** **Instructor(s)**	赵前程
6.	**是否面向本科生开放** **Open to undergraduates or not**	是
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.） 研究生无先修要求；高年级本科生的先修要求为以下课程任一门即可： EE208 工程电磁场理论或 SME205 电磁场与电磁波或 PHY207 电动力学导论

8. 教学目标
Course Objectives

（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.）

本课程旨在培养本科生对微纳尺度光学的兴趣，提升研究生定量分析微纳尺度光学过程的能力，主要分为三部分：我们首先讲解传统光学显微镜分辨极限的角谱表示，理解消逝波的工作方式；其次我们将分析显微镜超分辨技术，量子化的光源会引入光学态密度的讨论；最后我们将介绍光镊受力，理解它们在精准测量中的角色和在微纳操控中的潜力。学生进行分组展示近年半导体微纳光学芯片的应用进展和新机理。

The goal of this course aims to motivate the interests of students and foster their capability to quantitatively understand the fundamental concepts of nano-optics. We start with the angular spectrum representation to understand both the resolution limit of conventional optical microscopy, and the potentials provided by evanescent fields. We discuss the principles of super-resolution microscopy techniques, by introducing quantum light sources with a discussion on the optical density of states. Finally, we turn to optical forces and understand their role in precision measurements and the opportunities they provide for manipulation of nanoscopic objects. Students are highly encouraged to give group presentations of recent processes on nano-optics.

9. 教学方法
Teaching Methods

（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.）
讲授 Lectures
讨论 Discussions
报告以及研究生仿真实验 Presentation and Simulations

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	微纳光学概述 Introduction
Section 2	案例分析：芯片中的微纳光学 Case Study – Nano-optics equipped with microelectronics
Section 3	聚焦和电磁场的局域化（1）Focusing and Localization of Fields (1)

	Section 4	聚焦和电磁场的局域化（2）Focusing and Localization of Fields (2)
	Section 5	成像和显微 Imaging and Microscopy
	Section 6	点扩散函数和分辨极限 Point-Spread Function, Resolution Limits
	Section 7	格林函数和局部态密度 Green Functions, Local Density of States
	Section 8	自发辐射的控制 Spontaneous emission control
	Section 9	光学天线（1）Optical antennas（1）
	Section 10	光学天线（2）Optical antennas（2）
	Section 11	点散射理论 Point scattering theory
	Section 12	光子统计学 Photon statistics
	Section 13	光力与光镊 Optical Forces, Optical Tweezers
	Section 14	学生分组展示（1）Group Presentation 1/3
	Section 15	学生分组展示（2）Group Presentation 2/3
	Section 16	学生分组展示（3）Group Presentation 3/3

11. 课程考核
Course Assessment

（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.）
考查
出勤 Attendance 10%
课程作业 Assignments 30%
课堂表现 Class Performance 30%
期末口试 Final Oral Exam 30%

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

Principle of Nano-optics 2nd edition, Lukas Novotny and Bert Hecht, Cambridge 2012], ISBN：9780511794193