

课程大纲 COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	前沿生物医学成像技术概论 Advanced Techniques in Biomedical Imaging
2.	课程性质 Compulsory/Elective	Elective Courses (选修)
3.	课程学分/学时 Course Credit/Hours	3/48
4.	授课语言 Teaching Language	English/Chinese (中英文)
5.	授课教师 Instructor(s)	何思聪
6.	是否面向本科生开放 Open to undergraduates or not	否
7.	先修要求 Pre-requisites	无
8.	教学目标 Course Objectives	<p>本课程旨在开阔研究生的视野，使他们能有效掌握各类生物医学成像技术的原理与应用，以推动他们将会或现已投入的科研工作。本课程将介绍各种前沿成像技术的基础原理以及其在生物医学领域的研究应用。主要内容涵盖各类显微成像的技术背景和硬件的工作原理，样品的制备要求，以及实用的图像处理技术等。另外，将邀请国际主流生物显微镜厂家工程师为学生介绍各品牌的硬件特点及技术比较。完成此课程后，预期学生能认识各类生物医学成像技术的原理和特点，更进一步思考如何把这些前沿技术结合个人的研究课题。因此课程的考核会附加论文撰写，让学生思考和描述他们如何利用生物成像技术加强研究课题的质素。</p> <p>The aim of Advanced Techniques in Biomedical Imaging is to deliver the knowledge of the principles and applications of biological imaging techniques. This course will introduce the basic principles of various cutting-edge microscopic imaging technologies and their research applications in biomedicine. After completing this course, students will have a full picture about biological imaging, and acquire advanced knowledge of the principles of microscopes, sample preparation, image processing, etc. In addition, engineers of international biological microscope manufacturers will introduce their products and share their experiences with students.</p>
9.	教学方法 Teaching Methods	<p>这门课程将包括每周平均 3 小时的课程。期望学生于修读本课程后能具体充分掌握各类细胞、组织以及生物活体成像技术的研究方法，为以后的课题研究培养良好的设计能力。</p> <p>The course will consist of one or two two-hour class sessions per week. Students will fully understand the biological imaging technique, and get well prepared for their research projects in the future.</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	Fundamentals of Optics 光学基础知识介绍
Section 2	Interaction of Light with Matter 光与物质相互作用
Section 3	Fundamentals of Light Microscopy 光学显微镜基础
Section 4	Fluorescence Microscopy 荧光显微成像
Section 5	Nonlinear Optical Microscopy 非线性光学显微成像
Section 6	Super-resolution Microscopy 超分辨荧光成像
Section 7	Single Molecule Imaging 单分子成像技术
Section 8	Techniques for Determining Protein Structure 蛋白质结构检测技术
Section 9	Raman Spectroscopy and Microscopy 拉曼光谱与成像
Section 10	Optical Coherence Tomography 光学相干层析成像
Section 11	Photoacoustic Tomography 光声成像
Section 12	Ultrasound Imaging 超声成像
Section 13	Positron Emission Tomography & Computed Tomography 正电子发射计算机断层显像和电子计算机断层扫描技术
Section 14	Digital Image Processing 数字图像处理技术
Section 15	Artificial Intelligence Applications in Biomedicine 人工智能技术在生物医学领域的应用

**11. 课程考核
Course Assessment**

1. Attendance 20%
2. Assignment 20%
3. PPT Presentation 30%
4. Essay 30%

课程考核将由四个部分来决定：

1. 出勤，占 20%
2. 作业，占 20%
3. 专题口头报告，占 30%
4. 专题论文，占 30%

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

Reference book: Fundamentals of Light Microscopy and Electronic Imaging by Douglas B. Murphy_ Michael W. Davidson (2nd Edition, 2012)