

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	分子生物学实验方法及应用 Experimental methodology and application of molecular biology
2.	授课院系 Originating Department	医学院 School of Medicine
3.	课程编号 Course Code	MED226
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业选修课/Major Elective 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 Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	王艺瑾, 医学院, wangyj3@sustech.edu.cn; Yijin Wang, School of Medicine, wangyj3@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	
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	0	0	48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MED104 生物医学基础或 BIO103 生物学原理/MED104 Fundamentals in Biomedical Sciences or BIO103 Principles of Biology				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	待定/To be determined				
14. 其它要求修读本课程的学系 Cross-listing Dept.	待定/To be determined				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程在了解前沿医学科研进展的基础上，讲解各类基本及进阶分子生物学实验的概念、原理、实际操作方法和步骤；再回归到如何将这些技术手段应用于各领域的医学研究。通过本课程的学习，学生可以掌握各类分子生物技术的实验原理、操作步骤，了解各类技术在医学科研工作中的实际应用，旨在提升学生对几大类先进生物技术的理解，提高学生在医学科研工作中利用各种分子生物学技术解决医学科研问题的能力。

This major elective course aims to help students improve the ability of solving scientific problems with various kinds of molecular biological experimental methods in medical research work, based on understanding the basic biotechnological concepts and principles, learning the experimental process and steps. Upon completion of these courses, students are able to have a comprehensive opinion about gene engineering, gene editing technology, chromatin immunoprecipitation, biochip, single cell sequencing, gene engineering, etc, and know when and how to use in their medical research.

16. 预达学习成果 Learning Outcomes

1. 了解最新医学科研中应用的分子生物学实验技术。
2. 掌握各类基本及进阶分子生物学实验的概念、原理及操作步骤；
3. 掌握医学科研中如何应用分子生物学实验解决科学问题；

1. Understand the research team, research results and application of molecular biological methods, and lay a foundation for the future study of related majors.
2. Understand the concepts, principles, and experimental process and steps of basic/advanced molecular biological methods;
3. Master how to apply molecular biotechnologies in medical scientific research.

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. 生物技术概论 Introduction to biotechnology

介绍现代生物技术的概念、发展史上的重要事件、发展历史及发展方向；生物技术基本知识介绍。

The concept, important events in the development history, development history and development direction of modern biotechnology.

2. 基因工程 Gene engineering

介绍基因工程的概念及原理;质粒构建的原理与操作：包括酶切、连接、转化、筛选、扩增、提取、转染等;分子克隆在医学研究中的应用。

The concept and principle of gene engineering; the principle and operation of plasmid construction including enzyme digestion, linkage, transformation, screening, amplification, extraction, transfection; molecular cloning and its application in medical research.

3. 细胞培养及细胞转染 Cell culture and transfection

介绍细胞系的种类；细胞培养步骤及实验技巧；细胞转染的目的及原理；细胞转染方法、原理及步骤；细胞增殖及细胞毒性检测方法。

The types of cell lines; Cell culture operation and experimental techniques; The purpose and principle of cell transfection; Methods, principles and operation of cell transfection; Assay for cell proliferation and cytotoxicity.

4. DNA 扩增及检测技术 DNA amplification and analysis

讲解 DNA 琼脂糖凝胶电泳原理及应用、PCR 技术、定量 PCR 技术原理及应用。

The principle and application of DNA agarose electrophoresis, PCR technology, quantitative PCR technology principle and application.

5. 蛋白质表达检测技术 Analysis and protein expression

讲授 ELISA、Western Blot、免疫组化及免疫荧光等技术原理与应用；介绍双荧光素酶报告基因表达系统的原理及应用；蛋白表达检测在医学研究中的应用。

Principles and applications of ELISA, Western Blot, immunohistochemistry, immunofluorescence; The principle and application of double luciferase reporter gene expression system are introduced. Application of protein expression detection in medical research.

6. RNA 干扰原理及应用 Principle and application of RNA interference

介绍小 RNA 干扰、慢病毒包装原理及操作步骤;RNA 干扰在医学研究中的应用。

The principle and procedure of small RNA interference and lentivirus packaging are introduced. Application of RNA interference in medical research.

7. 基因编辑技术 Gene editing

介绍基因编辑常用的方法及原理、CRISPR/CAS9 原理及操作步骤以及 CRISPR/CAS9 在医学研究中的应用。

The common methods and principles of gene editing, CRISPR/CAS9 principle and operation, and the application of CRISPR/CAS9 in medical research were introduced.

8. 染色质免疫共沉淀技术 Chromatin immunoprecipitation technique

讲授 ChIP 技术原理、操作流程、结果的分析,以及 ChIP 技术在医学研究转录调控分析中的应用实例。

The principle, operation process, analysis of results of ChIP technology. And the application of ChIP technology in the analysis of transcriptional regulation in medical research.

9. 蛋白质互作技术 Protein-Protein interaction

介绍酵母杂交技术、噬菌体展示技术、CO-IP 技术、PULL-DOWN 技术的原理与步骤,同时讲解蛋白互作在医学研究中的应用实例。

The principles and operation of yeast hybridization, phage display, CO-IP and PULL-DOWN techniques were introduced, and the application examples of Protein-Protein interaction in medical research were also introduced.

10. 生物芯片技术原理及应用 Biochip technology

讲授生物芯片的分类、原理以及在医学诊断、筛查研究中的应用。

Classification, principle and application of biochip in medical diagnosis and screening.

11. 基因组测序原理及应用 Principle and application of DNA sequencing

介绍基因组测序技术的分类、原理、流程以及结果解读,同时介绍基因测序在医学研究中的应用。

The classification, principle, process and result interpretation of genome sequencing technology. The application of gene sequencing in medical research is also introduced.

12. 转录组学原理及应用 Transcriptomics (RNA-SEQ)

讲授转录组学常用的研究方法,同时介绍 RNA-SEQ 的原理、流程、结果解读以及在医学研究中的应用。

The principle, operation process, analysis of results of ChIP technology and the application of ChIP technology in transcriptional regulation analysis in medical research.

13. 蛋白质组学研究及应用 Proteomics

介绍双向电泳技术、荧光差异显示双向电泳技术、蛋白质质谱分析以及蛋白组学的应用实例。

The application of two-dimensional electrophoresis, two-dimensional fluorescence difference in gel electrophoresis, protein mass spectrometry and proteomics were introduced.

14. T 细胞受体测序实验原理及步骤 T cell receptor sequencing

讲授 TCR 的原理、流程、功能、应用背景，同时讲解 TCR 测序结果的分析以及在医学研究中的应用。

The principle, process, function and application background of TCR. The analysis of TCR sequencing results and its application in medical research are also explained.

15. 分子生物学实验方法应用讨论（一）

介绍感染免疫经典信号通路、感染免疫研究常用的实验方法以及课题实验的设计。

The classical signal pathway of infection immunity, the experimental methods and the design of the subject experiment.

16. 分子生物学实验方法应用讨论（二）

介绍肿瘤生物学经典信号通路、肿瘤学研究常用的实验方法以及对课题实验设计的讨论。

The classical signaling pathways in tumor biology, the experimental methods commonly used in oncology research and the design of experimental subjects.

Section	Topic	Hours
Section 1	分子生物学实验方法概论 Introduction to molecular biological experimental	3
Section 2	基因工程 Gene engineering	3
Section 3	细胞培养及细胞转染 Cell culture and transfection	3
Section 4	DNA扩增及检测技术 DNA amplification and analysis	3
Section 5	蛋白表达检测技术 Analysis of protein expression	3
Section 6	RNA干扰原理及应用 Principle and application of RNA interference	3
Section 7	基因编辑技术 Gene editing	3
Section 8	染色质免疫共沉淀技术Chromatin immunoprecipitation technique	3
Section 9	蛋白质互作技术 Protein-protein interaction	3
Section 10	生物芯片技术原理及应用 Biochip technology	3
Section 11	基因组测序原理及应用 Principle and application of dna sequencing	3
Section 12	转录组学原理及应用Transcriptomics (RNA-SEQ)	3
Section 13	蛋白质组学原理及应用 Proteomics	3
Section 14	T细胞受体测序实验原理及步骤 T cell receptor sequencing	3
Section 15	分子生物学实验方法应用讨论（一）	3
Section 16	分子生物学实验方法应用讨论（二）	3

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

- 1、朱旭芬、吴敏、向太和：《基因工程》，高等教育出版社出版，2014年
- 2、吴敬：《蛋白质工程》，高等教育出版社出版，2017年
- 3、(英)雷特迪吉：《生物技术导论教材》，科学出版社，2002年
- 4、马文丽、张超：《基因芯片技术》，化学工业出版社，2017年

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		10		
课堂表现 Class Performance		10		
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		40		
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		40		
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

本课程已经医学院分管教学副院长张文勇教授审核通过。