

## 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.	<b>课程名称 Course Title</b>	现代分子生物学 Advanced Molecular Biology
2.	<b>授课院系 Originating Department</b>	医学院 School of Medicine
3.	<b>课程编号 Course Code</b>	MED219
4.	<b>课程学分 Credit Value</b>	3
5.	<b>课程类别 Course Type</b>	专业基础课 Major Foundational Courses
6.	<b>授课学期 Semester</b>	秋季 Fall
7.	<b>授课语言 Teaching Language</b>	中英双语 English & Chinese
8.	<b>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 &amp; Contact (For team teaching, please list all instructors)</b>	贾宁, 医学院, jian@sustech.edu.cn; Ning Jia, School of Medicine, jian@sustech.edu.cn
9.	<b>实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact</b>	
10.	<b>选课人数限额(可不填) Maximum Enrolment (Optional)</b>	

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					
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite					
14. 其它要求修读本课程的学系 Cross-listing Dept.					

### 教学大纲及教学日历 SYLLABUS

#### 15. 教学目标 Course Objectives

This course is designed to provide students with a fundamental understanding of the biochemical mechanisms that control the maintenance, expression, translation and regulation of prokaryotic and eukaryotic genomes. Lecture topics will include DNA replication, gene expression and regulation, RNA processing, protein translation, as well as the latest research advances and applications in molecular biology, such as gene editing and genome sequencing. Students will learn how the information encoded in DNA is transcribed into RNA and then translated into functional proteins, as well as how these interactions are regulated. This course aims to inspire the students and pique their interest in basic science and its biomedical applications.

该课程旨在让学生了解原核和真核生物的生命活动及其相关的分子基础，其中包括遗传物质的传递，表达，翻译和调控。课程内容将包括 DNA 复制、基因表达、调控、RNA 加工、蛋白翻译以及分子生物学最新的研究进展和应用，例如基因编辑、基因组测序等。通过本课程，学生将理解遗传信从由 DNA 转录成 RNA，再翻译成蛋白质进行生命活动的传递过程，以及这些生命活动是如何被严格调控的。期望本课程能激发学生对基础生命科学及其生物医学应用的兴趣。

#### 16. 预达学习成果 Learning Outcomes

1. Account for the molecular nature of genes.
  2. Understand key events in molecular biology including mechanisms of DNA replication, translation, and transcription in prokaryotes and eukaryotes.
  3. Describe mechanisms of eukaryotic RNA processing.
  4. Know how transcriptional regulation works in prokaryotic as well as eukaryotic organisms.
  5. Know types of RNAs including catalytic RNA, regulatory RNA, coding and noncoding RNA.
  6. Understand the latest research advances and applications in molecular biology.
1. 掌握基因的分子结构。
  2. 理解分子生物学中原核和真核生物主要生命活动的分子基础：DNA 复制、转录和翻译。
  3. 理解真核生物 RNA 加工的机理。
  4. 了解原核和真核生物如何进行转录调控。
  5. 了解 RNA 的种类，包含催化 RNA、调控 RNA、编码和非编码 RNA。
  6. 了解分子生物学最新的研究进展和应用。

#### 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. Genes (total 6 hrs)

#### 基因 (共 6 小时)

##### 1.1 DNA: The Genetic Material (3 hrs)

DNA: 遗传物质 (3 小时)

##### 1.2 Nucleosomes, Chromatin, and Chromosome (3 hrs)

核小体, 染色质和染色体 (3 小时)

### 2. DNA replication, Recombination and Repair (total 9 hrs)

#### DNA 复制, 重组和修复 (共 9 小时)

##### 2.1 DNA replication (3 hrs)

DNA 复制 (3 小时)

##### 2.2 Homologous and Site-Specific Recombination (3 hrs)

同源重组与位点专一性重组 (3 小时)

##### 2.3 DNA Mutation, Repair and Transposable Elements (3 hrs)

DNA 突变、修复和转座元件 (3 小时)

### 3. DNA Transcription (total 15 hrs)

#### DNA 转录 (共 15 小时)

##### 3.1 Prokaryotic Gene Expression: Transcription (3 hrs)

原核生物基因表达: 转录 (3 小时)

##### 3.2 Eukaryotic Gene Expression: Transcription (3 hrs)

真核生物基因表达: 转录 (3 小时)

##### 3.3 RNA Processing (3 hrs)

RNA 加工 (3 小时)

##### 3.4 Protein Synthesis: Translation (3 hrs)

蛋白合成: 翻译 (3 小时)

##### 3.5 Catalytic RNA (3 hrs)

催化 RNA (3 小时)

### 4. Gene Regulation (total 12 hrs)

#### 基因调控 (共 12 小时)

##### 4.1 Regulation of Gene Expression in Prokaryotes (2 hrs)

原核生物基因表达调控 (2 小时)

##### 4.2 Phage strategies (2 hrs)

噬菌体策略 (2 小时)

4.3 Regulation of Gene Expression in Eukaryotes (2 hrs)

真核生物基因表达调控 (2 小时)

4.4 The Posttranscriptional Regulation of Gene Expression in Eukaryotes (2 hrs)

真核生物转录后基因表达调控 (2 小时)

4.5 Noncoding RNA (2 hrs)

非编码 RNA (2 小时)

4.6 Regulatory RNA (2 hrs)

调控 RNA (2 小时)

**5. The latest research advances and applications in molecular biology ( (6 hrs)**

分子生物学最新的研究进展和应用 (6 小时)

5.1 CRISPR-Cas gene editing (3 hrs)

CRISPR-Cas 基因编辑 (3 小时)

5.2 Genome sequencing (3 hrs)

基因组测序 (3 小时)

Section	Topic	Hours
1	DNA: The Genetic Material DNA: 遗传物质	3
2	Nucleosomes, Chromatin, and Chromosome 核小体, 染色质和染色体	3
3	DNA replication DNA 复制	3
4	Homologous and Site-Specific Recombination 同源重组与位点专一性重组	3
5	DNA Mutation, DNA Repair, and Transposable Elements DNA 突变、修复和转座元件	3
6	Prokaryotic Gene Expression: Transcription 原核生物基因表达: 转录	3
7	Eukaryotic Gene Expression: Transcription 真核生物基因表达: 转录	3
8	RNA Processing RNA 加工	3
9	Protein Synthesis: Translation 蛋白合成: 翻译	3
10	Catalytic RNA 催化 RNA	3
11	Regulation of Gene Expression in Bacteria 原核生物基因表达调控	2

12	Phage strategies 噬菌体策略	2
13	Regulation of Gene Expression in Eukaryotes 真核生物基因表达调控	2
14	The Posttranscriptional Regulation of Gene Expression in Eukaryotes 真核生物转录后基因表达调控	2
15	Noncoding RNA 非编码 RNA	2
16	Regulatory RNA 调控 RNA	2
17	CRISPR-Cas gene editing CRISPR-Cas 基因编辑	3
18	Genome sequencing 基因组测序	3

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

<p>参考书:</p> <p>1、Jocelyn E. Krebs, &lt;Lewin's GENES XII&gt; Jones &amp; Bartlett Learning, LLC, an Ascend Learning Company, 2018</p> <p>2、Michael M. Cox; Jennifer Doudna; Michael O'Donnell, &lt;Molecular Biology: Principles and Practice&gt; W. H. Freeman; Second edition, 2015</p>
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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				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		40		
期末实验考试 Final lab Exam				
期末考试		50		
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)				

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**