

课程大纲

COURSE SYLLABUS

1.	课程名称(中英文) Course Title(Chinese and English)	Advanced Biological Sciences
2.	课程类别 Course Type	Major Required Course (专业必修课)
3.	授课院系 Originating Department	Department of Biology (生物系)
4.	可选课学生所属院系 Open to Which Majors	生物系或相关院系
5.	课程学时 Credit Hours	48
6.	课程学分 Credit Value	3
7.	授课语言 Teaching Language	English (英语) /中英双语 English & Chinese
8.	授课教师 Instructor(s)	DU Jiamu (杜嘉木) RAO Feng (饶枫) LI Yan (李妍)
9.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无
10.	教学目标 Course Objectives	
	<p>Our objective is to give students a firm and rigorous foundation in the principles of modern molecular and cellular biology. These concepts form almost all the basis for the great advances now being made in biology and the medical sciences. The course will also focus on techniques and procedures commonly utilized in modern cell and molecular biology. After completing this course, students will acquire in depth understanding and advanced knowledge of a range of general and specialized areas in cell biology. They will develop insight into the complexities of cell structure and function, the molecular controls that govern the cells' dynamic properties, and cellular interactions with the organism as a whole. The development of critical thinking processes and proficiency in scientific reading and writing will be emphasized throughout the course.</p> <p>这门课旨在让学生对现代分子细胞生物学打下坚实基础。当中涉及的概念几乎涵盖了当今生命及医</p>	

药科学进展中的各个方面。课程还将介绍现代细胞及分子生物学中常用的技术和手段。完成此课程后，学生将对细胞的结构和功能、细胞的动态特性、细胞相互作用以及生物体作为一个整体的分子调控的复杂性有一个深入的认识。同时课程将自始至终着重培养学生的逻辑思辨，科学阅读及写作能力。

11. 教学方法及授课创新点 Teaching Methods and Innovations

The course will consist of a two-hour class session or 2 two-hours sessions per week. Homework and pre-class assignments will be required for some classes. Some instructors may have introductory reading assignment, some may have pre-recorded content, which students need to review in order to be sufficiently prepared for the class. Students will have opportunities to do scientific presentations in English for some class sessions.

这门课程将包括每周 1 次或 2 次 2 小时的课程。有些课程有作业和课前作业。对于有些课，导师可有介绍性的阅读作业，或有预先录制的内容，学生需要预习，以为课堂讨论做充分准备。学生们在一些课上会得到用英文进行科学报告的机会。

12. 教学内容及学时分配 Course Contents and Course Schedule

Section I: Introduction to the basic biochemistry and genetic mechanisms (16 hrs) 基础生物化学与遗传学机制 (Instructor: DU Jiamu 授课人: 杜嘉木):

Lecture 1. Introduction to the Course:, and basic introduction of cell; (2 hrs) 课程简介

- Syllabus: prerequisites, grading, exam schedule, and course introduction (1 hr) 教学大纲
- Introduction of cell and genome (1 hr) 细胞及基因组基本介绍

Lecture 2. Cell chemistry (2 hrs) 细胞的化学基础

- Weak interactions and chemical bonds (0.5 hr) 生命体系的相互作用及化学键
- Chemical building blocks of the cell (1 hr) 细胞的化学组成
- Biochemical energetics (0.5 hr) 生命体系的热力学解析

Lecture 3. Protein structure and function (2 hrs) 蛋白质结构和功能

- Structure of protein: primary, secondary, tertiary, and quaternary structures (1 hr) 蛋白质结构
- Protein binding and regulation of protein function (1 hr) 蛋白质功能及其调控

Lecture 4. DNA, chromatin, and genome. (2 hrs) 生命体遗传物质

- DNA structure and chromosome structure (1 hr) DNA及染色体的结构

- Regulation of chromatin structure (1 hr) 染色质结构调控

Lecture 5. DNA replication, repair, and recombination (2 hrs) DNA复制、修复和重组

- DNA mutation and repair (0.5 hr) 突变和修复
- DNA replication mechanism (1 hr) DNA复制机制
- Replication of chromosome (0.5 hr) 染色质复制机制

Lecture 6. Basic transcription and translation. (2 hrs) 转录和翻译

- The mechanism of transcription (1 hr) 转录机制
- The mechanism of translation (1 hr) 翻译机制

Lecture 7. Transcription control and regulation (3 hrs) 转录调控和控制

- Biochemical basis for transcription regulation (1 hr) 转录调控的生化基础
- Genetic control: (1 hr) 遗传控制
- Post-transcriptional control (1 hr) 转录后调控

Lecture 8. Introduction of modern molecular biology: manipulating proteins, DNA, RNA (1 hr) 现代分子生物学

Modern molecular biology: mechanism and application (1 hr) 现代分子生物学的原理及应用

Section II: General cell physiology and cellular communication 细胞生理学和细胞通讯 (16 hrs)

(Instructor: RAO Feng 授课人: 饶枫)

Lecture 9. Membrane Structure 细胞膜性结构

- Membrane lipids (1hr) 膜脂类分子
- Membrane proteins (1hr) 膜蛋白类分子

Lecture 10. Membrane Transport 膜转运

- Membrane permeability and potential (1hr) 膜通透性与膜电位
- Membrane Transporters and Channels (1hr) 膜转运蛋白与离子通道

Lecture 11. Intracellular Compartments and Protein Sorting 细胞器与蛋白分选

- Cellular compartmentalization and Nucleus-cytosol transport (1hr) 细胞内区室, 核-质蛋白运输
- Mitochondria/chloroplast and ER/Peroxisome transport (1hr) 线粒体/叶绿体蛋白运输和内质网/过氧化物酶体蛋白运输

Lecture 12. Intracellular Vesicular Traffic 细胞内囊泡转运

- Exocytosis/Endocytosis (1hr) 外泌/内吞
- ER-Golgi/TGN-Lysosome transport (1hr) 外泌/内吞

Lecture 13. Cellular Metabolism 细胞代谢

- Glucose metabolism (1hr) 葡萄糖代谢
- Fatty acid metabolism (1hr) 脂肪酸代谢
- Amino acid metabolism (1hr) 氨基酸代谢
- Nucleotide metabolism (1hr) 核酸代谢

Lecture 14. Cell Communication 细胞通讯

- Principles of cell signaling and GPCR (1hr) 细胞信号转导, G蛋白偶联受体信号通路
- Signaling through Enzyme-coupled receptors or other routes (1hr) 酶偶联受体通路与其他信号转导通路

Presentation on a topic related to the teaching content (2hrs)

Section III: Cell regulation and cells in their social context (16 hrs) 细胞调控及机体环境中的细胞

(Instructor: LI Yan 授课人: 李妍)

Lecture 15. The cytoskeleton (2hrs) 细胞骨架

- Structures of cytoskeletal filaments (1hr) 细胞骨架的结构
- How cells regulate cytoskeletal filaments (1hr) 细胞骨架的调控

Lecture 16. The cell cycle (2hrs) 细胞周期

- The cell cycle control system (1hr) 细胞周期调控系统的组成
- Control of cell division and cell growth (1hr) 调控细胞分裂和细胞生长

Lecture 17. Cell death (2hrs) 细胞死亡

- Different types of cell death (1hr) 细胞死亡的种类
- Methods in cell death identification and pathways in cell death (1hr) 细胞死亡的鉴定与信号转导变化

Lecture 18. Cell junctions, cell adhesion and the ECM (4hrs)

- Cell-cell and cell-ECM junction and adhesion (3hrs) 细胞间及细胞外基质连接与粘附
- Extracellular Matrix (1hr) 细胞外基质

Lecture 19. Introduction to Cancer Cell biology (2hrs) 肿瘤细胞生物学简介

- The nature and cause of cancer (1hr) 肿瘤的本质与产生原因
- Cancer stem cell, metastasis and treatment (1hr) 肿瘤干细胞，转移与治疗

Presentation on a topic related to the teaching content (4hrs) 学生报告

13. 课程考核 Course Assessment

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		25		
	平时作业 Assignments				
	期中考试 Mid-Term Test				
	期末考试 Final Exam		40		
	期末报告 Final Presentation		25		
	其它（可根据需要 改写以上评估方 式） Others (The above may be modified as necessary)				

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

The required text is the Fifth edition (2008) of *MOLECULAR BIOLOGY OF THE CELL*,
by Alberts, Johnson, Lewis, Raff, Roberts and Walter.