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 MOLECULAR BIOLOGY**
2.	**授课院系 Originating Department**	生物系 Department of Biology
3.	**课程编号 Course Code**	BIO320
4.	**课程学分 Credit Value**	3
5.	**课程类别 Course Type**	专业基础课（生物科学、生物技术、生物信息学专业） Major Foundational Courses（Biological Sciences, Biotechnology, Bioinformatic Majors）
6.	**授课学期 Semester**	春季 Spring / 秋季 Fall
7.	**授课语言 Teaching Language**	英文 English / 中英双语 English & Chinese
8.	**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& Contact（For team teaching, please list all instructors）**	邓怿，副教授，生物系，dengy@sustech.edu.cn (DENG Yi, Associate Professor, Biology Department) 李瑞熙，助理教授，生物系，lirx@sustech.edu.cn (LI Ruixi, Assistant Professor, Biology Department)
9.	**实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact**	待公布 To be announced
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				
40			8(presentation)	48

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	BIO103 生物学原理 Principles of Biology
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	None 无
14.	其它要求修读本课程的学系 **Cross-listing Dept.**	生物医学工程系 Department of Biological Engineering, 医学院 Medical School

教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

Molecular Biology is a course is about genes - their structure and function- at the molecular level. The objective is to give you a firm and rigorous foundation in understanding gene expression and its regulation. We will begin with a review of structure of protein and nucleic acid, and the physical and chemical properties that drive interactions of protein with nucleic acid. Next, we will study the molecular mechanics of DNA replication, DNA damage repair, transcription in both prokaryotic and eukaryotic organisms, with an emphasis on how the activity of genes is regulated at the molecular level through nucleic acid-protein interactions. Genomics and systems biology will also be introduced and we will review advances in genomics projects that are altering our understanding of molecular biology. Lastly, we will study methods and technologies applied to study genes, which can be applied to human genetic analysis and finding disease genes.

16. **预达学习成果 Learning Outcomes**

Students are expected to do some preparation before the lecture to make room for question based interactive learning during the lecture slot. In this way, students can use (rather than simply remember) the new concepts and information, to form a deeper understanding of the new material.

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.)

LECTURE SYNOPSES

Lecture 1. Introduction to Molecular Biology 2018-2019 (2 hrs)

Concept #1: Chemistry basis of information molecules (total 2 hrs)

Lecture 2. Chemistry basis of information molecules (2 hrs)

- Protein structure
- DNA structure and topology
- DNA-protein interaction

Concept #2: Replication, recombination, transcription, and translation (total 16 hrs)

Lecture 3. How do organisms copy their genomes? (2 hrs)

- The basic mechanism of DNA replication: Origins of Replication, DNA Helicases, DNA Polymerases, Clamps
- Replication in prokaryotes

□Replication in eukaryotes; the end-replication problem, telomeres and telomerase

□Replication regulation

Lecture 4. How do organisms protect their genomes (part I)? (2 hrs)

□Spontaneous DNA mutation

□Mutagenesis, screening and selection

□Mismatch Repair (MMR)

Lecture 5. How do organisms protect their genomes (part II)? (2 hrs)

□Base excision repair (BER)

□Nucleotide excision repair (MER)

□Non-homologous end joining (NHEJ)

Lecture 6. DNA repair by homologous recombination (2 hrs)

□DNA Double Strand (DBS) break and repair

□Homologous recombination in DNA repair

□Enzymatic machines in homologous recombination

Lecture 7. Site-specific recombination and transposition (2 hrs)

□Conservative site-specific recombination (CSSR)

□Transpositional recombination

□Interesting examples of Transposable elements and their regulation

Lecture 8. DNA-dependent RNA synthesis (Transcription) (2 hrs)

□Transcription basics: RNA polymerases and promoter region

□Transcription in bacteria

□Transcription in eukaryotes

□Transcription factors

Lecture 9. Genetic code, protein synthesis, and consequences of mutation (2 hrs)

□Elucidation and general features of the code

□Cracking the genetic code

□tRNA

□Ribosome

□Translation initiation, elongation, and termination

Concept #3: Regulation (total 12 hrs)

Lecture 10. The prokaryotic gene: structure and regulation (2 hrs)

□Why regulate gene expression?

□Transcriptional regulation of gene expression in prokaryotes (Operons)

□Negative and positive control: Lac, Trp, and AraC examples

□Regulation by RNA structure: Riboswitch

□Regulation of Translation through Ribosomal Proteins (r-protein)

□Control of Gene Expression in Bacteriophage □

Lecture 11. The eukaryotic genome structure, modification, and regulation (2 hrs)

□Chromosome Structure and Its Effects on DNA Metabolism

□Nucleosome

□The regulation of chromosome structure and function

□Histone modification

Lecture 12. Transcriptional & Posttranscriptional regulation of gene expression in Eukaryotes (6 hrs)

□Transcription factors (activators), and co-activators/co-repressors, and mediators

□Combinatorial control of transcription initiation

□Regulation transcription initiation Unique to Eukaryotes

□mRNA processing and transport

□mRNA stability

□miRNA

□Signaling transduction regulates transcription

Lecture 13. Translational regulation of gene expression in Eukaryotes (2 hrs)

□Translational regulation of gene expression in eukaryotes

□Post-translational regulation gene expression in eukaryotes

Concept #4: From gene to genesis (total 2 hrs)

Lecture 14. Putting it all together: Gene regulation in development (2 hrs)

□Regulation of gene expression in embryonic development

Concept #5 Genetic engineering (total 4 hrs)

Lecture 15. Study genes and genetic intervention (2 hrs)

Lecture 16. Genome and beyond (2 hrs)

Presentation (8 hrs)

Spare/Revision/overruns (2 hrs)

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

参考教材 Reference books:

1. Cox, MM, Doudna, JA, Donnell MO (2014) Molecular Biology: Principles and Practice (2nd Edition) W. H. Freeman and Company, New York

2. Watson, JD, Baker, TA et al (2013) Molecular Biology of the Gene (7thEdition), Cold Spring Harbor Laboratory Press, New York

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**		10		
课程项目 **Projects**		20		
平时作业 **Assignments**		20		
期中考试 **Mid-Term Test**				
期末考试 **Final Exam**		40		
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

本课程经生物系本科教学指导委员会审议通过。
This Course has been approved by Undergraduate Teaching Steering Committee of Department of Biology.