

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	合成生物学导论/ Basic Synthetic Biology
2.	授课院系 Originating Department	化学生物学系/ Department of Chemical Biology
3.	课程编号 Course Code	BIO224
4.	课程学分 Credit Value	3 学分/48 学时
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 (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)	李颜颜-化学生物学系 助理教授 Yanyan Li, Department of Chemical Biology, liyy6@sustech.edu.cn
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
	40	8			48
学时数 Credit Hours					
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	BIO102B 生命科学概论 Introduction to Life Science				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无/None				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无/None				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

合成生物学是 21 世纪初出现的一门新兴交叉学科，在这里，生物学、工程学和数学紧密地结合在一起。合成生物学的出现是分子生物学经历了半个多世纪的发展，特别是人类基因组和模式生物基因组计划实施以来，伴随着生物信息学和系统生物学迅速发展的一个合乎逻辑的结果。在人类深入认识生命现象的基础上，合成生物学旨在设计和构建工程化的生物系统，使其能够处理信息、操作化合物、制造材料、生产能源、提供食物、保持和增强人类的健康和改善环境。因此，合成生物学既是一门科学，也是一门技术，它是继遗传工程之后出现的新一代生物技术，代表了生物技术发展的一个新的制高点。本课程的目标是为生物学各专业的学生拓宽视野，增长合成生物学方面的新知识，感受到最新的科技发展，为培养高层次创新型人才奠定坚实的基础。

Synthetic biology is an emerging interdisciplinary discipline that has emerged in the early 21st century, where biology, engineering, and mathematics are closely integrated. The emergence of synthetic biology is a logical result of the rapid development of bioinformatics and systems biology that molecular biology has experienced for more than half a century, especially since the implementation of the human genome and Model Organism genome project. Building on our deep understanding of the phenomena of life, synthetic biology seeks to design and construct engineered biological systems that can process information, manipulate compounds, manufacture materials, produce energy, provide food, maintain and enhance human health and improve our environment. Therefore, synthetic biology is not only a science, but also a technology, it is a new generation of biotechnology after genetic engineering, representing a new commanding height of the development of biotechnology. The goal of this course is to broaden the horizon of biology majors, increase the new knowledge of synthetic biology, feel the latest technological development, and lay a solid foundation for cultivating high-level innovative talents.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，学生可以

- 1、了解合成生物学的发展史
- 2、初步掌握合成生物学的基本原理
- 3、了解合成生物学的实验基础
- 4、初步掌握合成生物学的应用前景

At the end of the course, students should be able to

1. Understand the history of synthetic biology
2. Grasp the knowledge of basic principles of synthetic biology
3. Understand the methods and means of synthetic biology

4. Master the application prospect of synthetic biology

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.)

Section 1. Introduction to Synthetic biology/合成生物学概述（4 学时）

- 1.1 Historic view of synthetic biology/ 合成生物学的起源与发展
- 1.2 The definition of synthetic biology /合成生物学的定义
- 1.3 The main research content of synthetic biology / 合成生物学的研究内容
- 1.4 Implications of synthetic biology /合成生物的应用及意义

Section 2. Design of synthetic biological module / 合成生物学模块设计（8 学时）

- 2.1 genetic circuit / 基因线路概述
- 2.2 Gene regulatory switch / 基因调控元件
- 2.3 Reconstruction of the phage genome/ 噬菌体基因组的重构
- 2.4 Engineered scaffold protein / 支架蛋白的工程后重构

Section 3. Design of synthetic biological systems / 合成生物学系统设计（8 学时）

- 3.1 Basic design of synthetic biological system /合成生物学系统设计的基本原理
- 3.2 Hierarchical structure of biological system /合成生物学系统的层次构架
- 3.3 Standard quantitative mechanism /定量机制
- 3.4 Logical topology of synthetic biological systems /合成生物学系统的逻辑原理

Section 4. Mathematical simulation of synthetic biological systems/合成生物学的数学模拟（8 学时）

- 4.1 Logistic model / 逻辑模型
- 4.2 Pattern recognition /模式识别
- 4.3 Stability analysis / 稳定性分析
- 4.4 Sensitivity analysis/ 灵敏度分析

Section 5. Applied research in synthetic biology / 合成生物学的应用（8 学时）

- 5.1 Synthetic biology is used to maintain human health / 合成生物学在人类健康中的应用
- 5.2 Synthetic biology is used to produce bioenergy / 合成生物学在生物能源中的应用

- 5.3 Synthetic biology for environmental governance / 合成生物学在环境中的应用
- 5.4 Synthetic biology for Microbiological system / 合成生物学在微生物系统中的应用
- Section 6. Review of course materials and Presentations/ 课程总结与报告总结讨论 (12 学时)**
- 6.1 Review course topics/ 课程总结 (2 学时)
- 6.2 Student-driven presentations and discussions/ 学生主导的关于合成生物学应用的报告和讨论 (8 学时)
- 6.3 Questions and answers/ 问答 (2 学时)

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

宋凯 - 合成生物学导论 (2010, 科学出版社)

Geoff Baldwin et al. Synthetic Biology_ A Primer (2015, Imperial College Press)

Church George. M_Regis Ed-Regenesis_-how-synthetic-biology-will-reinvent-nature-and-ourselves-_2016

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		20		
课堂表现 Class Performance		20		
小测验 Quiz				
课程项目 Projects		20		
平时作业 Assignments				
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

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

本课程经生命科学学院教学工作委员会审议通过

This course is approved by the Teaching Affairs Committee, School of Life Sciences.