

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	合成生物学导论与实验基础 Basic Synthetic Biology and Laboratory
2.	授课院系 Originating Department	生物系 Department of Biology
3.	课程编号 Course Code	BIO211
4.	课程学分 Credit Value	2
5.	课程类别 Course Type	专业选修课（生物科学、生物技术、生物信息学专业） Major Elective Courses(Biological Sciences, Biotechnology, Bioinformatics Majors)
6.	授课学期 Semester	夏季 Summer
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)	生物系-黄巍副教授 Department of Biology, Prof. Wei Huang, huangw@sustc.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	无 NA
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	通过全校报名，多轮选拔产生 The students are from preselection

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	6	10	28	30 (集体讨论, group discussion)	74

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	合成生物学导论与实验基础课为生物系学生的专业选修课, 同时也是合成生物学元器件、合成生物学线路及合成生物学系统整合三门通识通修选修课, 及参加国际基因机器大赛的必修课程。 "Basic Synthetic Biology and Laboratory" course is an elective course suitable for biology majors. It is also a prerequisite for Synthetic Biology Components, Synthetic Biology Circuits, and Synthetic Biology System Integration Courses, and participation to iGEM.				
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

合成生物学是一种新兴的结合工程手段和科学思想的交叉学科, 将对生物问题的理解和生物科学的应用产生巨大的推动作用。iGEM (国际基因机器大赛)是以本科生为主导的国际合成生物学科竞赛, 有利于培养学生的科研创新能力, 合作精神和多学科交叉学习能力。然而世界知名大学及南科大的 iGEM 比赛往往过分强调比赛, 忽略了对本科生合成生物学相关学科的系统培养。

生物系开设合成生物学导论与实验基础这门课, 接受大一及以上的学生, 在暑期学期进行强化的合成生物学实验技能培训, 和对合成生物学发展史、经典课题、最新进展、及相关实验及理论方法学进行系统的讲授和研讨, 并引导学生自主学习, 互相学习, 分组提出、论证合成生物学短期研究课题。

合成生物学导论与实验基础课的目的旨在为生物系及相关系学生提供基本的实验室培训、并培养阅读和甄别前沿科研文献的能力、科学的思维方法和多学科合作学习、研讨的能力。学生将循序渐进地、系统地获得科研实验方法和提出科研问题的能力, 为组队参加国际基因机器大赛打下学科知识和科研合作的基础, 也为他们的毕业论文打下良好基础。

Synthetic Biology is a new scientific discipline that integrates engineering approach and scientific thinking. It will provide driving force for understand basic biological questions as well as application of biological sciences. International Genetic Engineered Machine (iGEM) is a prominent international synthetic biology research competition primarily run by undergraduate students. It promotes innovation, cooperativity and multidisciplinary trainings to undergraduate students. However the top universities in the world, SUSTC included, are too focused on the competition itself and neglect the systematic undergraduate educations in synthetic biology and related disciplinary.

The Department of Biology offers Basic Synthetic Biology and Laboratory Course every summer to provide students from Biology and other departments with basic laboratory training, and training in critical studying scientific literatures, and scientific and logical reasoning, and capability to team learning and multidisciplinary exposures.

The students are expected to gradually learning the scientific experimental research methodology, and the capability to raise sound scientific questions. It will also lead to assemble the SUSTC iGEM team. This course will also lay the

foundation for their own final year project research.

16. 预达学习成果 Learning Outcomes

本课程完成后，学生将能够：

- 熟悉并了解生物实验室。
- 熟悉并了解分子生物学与合成生物学实验基础。
- 通过授课、引导性教学与研讨，理论指导和实验，探索所选择的专业。
- 明确并评估自己将来的学术和职业目标。

On completion of this course, students are expected to:

- Have a basic, practical understanding of the biology research laboratory.
- Have an understanding of the general techniques employed carried out in biology laboratory biological research.
- Gain practical work experience by applying classroom-learned concepts on the job in assigned lab research work.
- Explore the chosen major.

Clarify and evaluate academic and career goals.

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.)

Lectures

1-2hr. Engineering principle of Synthetic Biology, The techniques of gene editing

3-4hr. Synthetic biology based on known engineering principle, Synthetic Biology to test unknown principle, The applications of Synthetic Biology

5-6hr. Introduction of iGEM 和 Biobricks

7-16hr. Seminars on classic synthetic biology papers

17-26hr, Students presentation of previous iGEM projects won major awards

27-40hr, Student discuss assigned and self-picked most recent synthetic biology papers

41-46hr, Brainstorming, students forming their own synthetic biology project, formulize the research plan, including experimental and theoretical parts.

Laboratory

Day1 (4hrs)

lecture on making competent cells,

Inoculate DH5 to LB broth (without antibiotics) and incubate at 18°C for ~3 days,

Inoculate bacteria with plasmids to LB broth and incubate at 37°C for 16 h

Day2 (8hrs)

Lecture on Plasmid purification and enzyme digestion

Plasmid purification,

make enzyme digestion system and incubate at 37°C for ~3 h

lecture on preparing medium & pH meter

prepare TB (Inoue) - pH meter, filter

prepare TAE buffer

prepare antibiotics stock solution - filter

store the enzyme digestion system at 4°C

Day 3 (8hrs)

Lecture on electrophoresis and gel extraction

*make agarose gel

*Prepare LB broth medium & LB agar plate - autoclave

*electrophoresis

*gel extraction with kit and electrophoresis

Lecture on ligation and transformation

*pour LB agar plate (antibiotics)

*ligation and transformation

Day 4 (8hrs)

Lecture on screening PCR

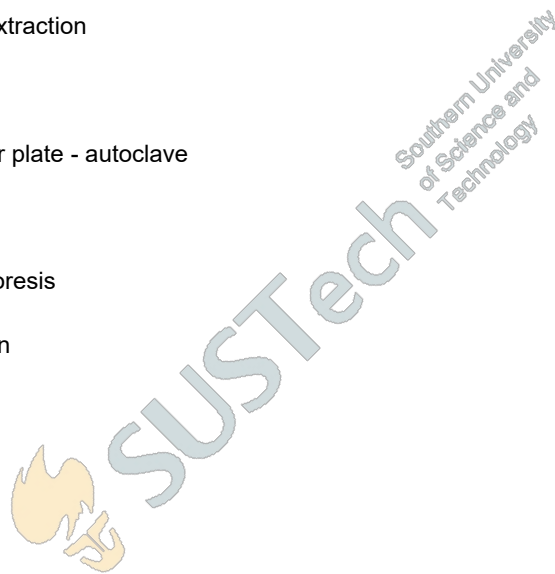
*make PCR system

*make agarose gel

Lecture on spectrophotometer

*measure OD600

*electrophoresis



*measure OD600
*prepare competent cells

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

合成生物学导论 Introduction to Synthetic Biology,
宋凯编著, 黄熙泰主审, 高等教育出版社, 2010, ISBN 978-7-03-026731-3
以及相关合成生物学前沿文献

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				
课堂表现 Class Performance		60 The evaluation provided by the supervising professor, on the basis of the following aspects: Performance in Laboratory work; Attendance and participation in lecture , performance in presentations . 由教授来评估: 实验室的工作表现; 出勤情况; 在 pre 中的表现		
小测验 Quiz				
课程项目 Projects				
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 The final PPT-based oral presentation given by the student on their research proposal on synthetic biology. 此部分评估学生的口头报告 (关于课程生物学研究)		
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**

- | |
|--|
| <input type="checkbox"/> A. 十三级等级制 Letter Grading
<input checked="" type="checkbox"/> 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.

