

## 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 <b>Course Title</b>	植物生理学实验 <b>Plant physiology laboratory</b>				
2.	授课院系 <b>Originating Department</b>	生物系 Department of Biology				
3.	课程编号 <b>Course Code</b>	BIO209-15				
4.	课程学分 <b>Credit Value</b>	1				
5.	课程类别 <b>Course Type</b>	专业选修课(生物科学、生物技术、生物信息学) Major Elective Courses (Biological Sciences, Biotechnology, Bioinformatics)				
6.	授课学期 <b>Semester</b>	秋季 Fall				
7.	授课语言 <b>Teaching Language</b>	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) <b>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	马小英 生物系 Maxy@sustech.edu.cn 余春红 生物系 yuch@sustech.edu.cn Ma Xiaoying, Department of Biology, Maxy@sustech.edu.cn Yu chunhong, Department of Biology, yuch@sustech.edu.cn				
9.	实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	无 NA / 待公布 To be announced / 已确定的实验员/助教联系方式 Please list all Tutor/TA(s) (请保留相应选项 <b>Please only keep the relevant information</b> )				
10.	选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>	贾方兴, 生物系, jiafx@sustech.edu.cn 张敏, 生物系, zhangm6@sustech.edu.cn Jia fangxing, Department of Biology, jiafx@sustech.edu.cn Zhang min, Department of Biology, zhangm6@sustech.edu.cn				
11.	授课方式 <b>Delivery Method</b>	讲授 <b>Lectures</b>	习题/辅导/讨论 <b>Tutorials</b>	实验/实习 <b>Lab/Practical</b>	其它(请具体注明) <b>Other (Please specify)</b>	总学时 <b>Total</b>
	学时数 <b>Credit Hours</b>			课堂实验 56 学时 class experiment 56 h	课后实验观察 8 学时 Observation after class 8 h	64

12. 先修课程、其它学习要求 <b>Pre-requisites or Other Academic Requirements</b>	先选: BIO207-15 植物生理学, Plant physiology 先修: BIO104 普通生物学实验, General Biology Laboratory.
13. 后续课程、其它学习规划 <b>Courses for which this course is a pre-requisite</b>	
14. 其它要求修读本课程的学系 <b>Cross-listing Dept.</b>	

### 教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

通过植物生理学实验课程的学习, 学生将深入理解植物生长发育过程中的基本生理过程, 有关植物形态、结构、功能之间关系的知识将得到巩固和加强。本课程通过植物生长与发育调节、植物细胞与组织、植物转基因技术、植物矿质营养与水分生理、植物对逆境的反应等几大模块, 让学生掌握植物生理学实验中常用的实验方法和实验技术, 学习植物研究的科学思维, 培养良好的实验习惯, 为日后生物学相关知识的学习与工作奠定基础。According to the study of plant physiology laboratory, students will intensively understand the basic physiological processes during plant growth and development. The knowledge about the relationships of morphology, structures and functions will be reinforced. This course includes several modules such as regulations of plant growth and development, plant cells and tissues, plant transgenic technologies, plant Inorganic nutrients and water, responses of plants to environmental stresses. Students will master some popular laboratory methods and techniques for plant study according to these modules. Their scientific thinking and experimental habits will be well trained. The study will lay the foundation for further learning on biology.

16. **预达学习成果 Learning Outcomes**

通过对本课程的学习, 学生将熟悉和掌握植物生理学实验常用的实验方法和实验技能, 学生的实验操作能力和科学思维将得到很好的提升。通过本课程的学习, 学生将对植物组织培养、植物水培、植物组织切片、植物转基因技术等知识有更深入的理解。本课程可增强学生对植物生理学理论知识的理解, 提高创新意识和综合素质。

According to the studies of plant physiology laboratory, students will master the basic experimental methods and techniques for plant study. This course will promote students' operation skills and scientific thinking. Students will have better understandings about plant tissue culture, plant hydroponics, paraffin section, plant transgenic technologies. The theory of plant physiology will be understood better and students' innovative consciousness and comprehensive quality will be promoted.

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.)**

#### NO.1 课程介绍(4h)

介绍植物生理学实验的基本内容、课程要求、实验安排、考核方式等，同时介绍实验室安全。

Introduction to plant physiology laboratory including course contents, evaluations, requirements, and schedules. Laboratory safety will be emphasized.

#### NO.2 实验 1、2 (4h)

实验 1: 植物组织培养中激素对形态建成的影响 (1)

Experiment 1: Effects of Hormones on Morphogenesis in Plant Tissue Culture (1)

介绍植物组织培养基础知识，准备植物组织培养的培养基。

To understand the basic knowledge about plant tissue culture & prepare the culture medium for plant tissue culture.

实验 2: 种子和根系活力检测

Experiment 8: Testing of Seed and Root Viability

学习种子与根系活力的基本知识，学习如何检测种子和根系的活力。

To understand the basic knowledge about seed and root viability & know how to test seed and root viability.

#### NO.3 实验 3、4 (4h)

实验 3: 植物组织培养中激素对形态建成的影响 (2)

Experiment 3: Effects of Hormones on Morphogenesis in Plant Tissue Culture (2)

学习植物组织培养无菌操作技术，理解不同培养基对离体植物组织形态建成的影响。

To manipulate plant tissue culture using aseptic techniques & understand the different medium effects on plant morphogenesis in vitro.

实验 4: 植物生长调节剂对烟草实生苗的生理影响

Experiment 4: Physiological Effects of Plant Growth Regulators (PGRs) in Tobacco Seedlings

理解植物激素的基本生理功能，理解不同的植物生长调节剂对烟草实生苗的生理影响。

To understand the basic physiological function of plant hormones & understand the basic effects of different Plant Growth Regulators (PGRs) in tobacco seedlings

#### NO.4 实验 5、6 (4h)

实验 5: 叶绿体分离与希尔反应

#### Experiment 5: Chloroplasts Separation and Hill Reaction

学习差速离心法分离植物的细胞器叶绿体，学习叶绿体的希尔反应。

To learn how to isolate chloroplasts using differential-centrifugation & learn the Hill reaction of chloroplast.

实验 6：光合色素的层析分离与叶绿素吸收光谱检测

#### Experiment 6: Photosynthetic Pigments Chromatography and Determination of the Absorption Spectrum of Chlorophyll

学习分离和提取光合色素，学习叶绿素吸收光谱的检测。

To study how to extract and separate the photosynthetic pigments & learn how to determine the absorption spectrum of chlorophyll.

#### NO.5 实验 7、8 (4h)

实验 7：百合花粉管 Actin 细胞骨架成像

#### Experiment 7: Imaging the Actin Cytoskeleton in Lily Pollen Tubes

学习百合花粉萌发的基本方法，理解百合花粉管 actin 细胞骨架荧光标记的方法。

To learn the basic methods for lily pollen germination & understand the fluorescent labeling of actin cytoskeleton in lily pollen tubes.

实验 8：拟南芥根系的向地性

#### Experiment 8: Root Gravitropism in Arabidopsis thaliana

学习拟南芥的栽培，观察拟南芥根系的向地性。

To learn how to grow Arabidopsis thaliana & observe the root gravitropism.

#### NO.6 实验 9 (4h)

实验 9：植物组织与细胞的结构（石蜡切片 1）

#### Experiment 9: Organizations of Plant Tissues and Cells (Paraffin Section 1)

学习石蜡切片的基本过程，准备植物组织的石蜡包埋块。

To learn and understand the essential methods of tissue slice processing & prepare paraffin block for microscopy study of plant cells and tissues.

#### NO.7 实验 10 (4h)

实验 10：植物组织与细胞的结构（石蜡切片 2）

Experiment 10: Organizations of Plant Tissues and Cells (Paraffin Section 2)

学习石蜡切片的切片方法，切片的染色和植物永久切片的制作。

To learn how to make paraffin slices & learn the basic staining methods of paraffin slices & learn how to make a permanent specimen slide.

NO.8 实验 11、12 (4h)

实验 11: GUS 报告基因检测转基因植物

Experiment 11: Identification of Genetically Modified (GM) Plant by GUS Reporter Gene

理解什么是转基因植物，学习利用 GUS 报告基因进行转基因植物的鉴定。

To understand genetically modified (GM) plant & detect the genetically modified (GM) plant by GUS histochemical assay.

实验 12: 原生质体分离

Experiment 12: Protoplasts Isolation

学习植物原生质体分离的原理与技术。

To learn the principles and techniques of plant protoplast isolation.

NO.9 实验 13 (4h)

实验 13: 荧光融合蛋白在原生质体中的瞬时转化

Experiment 13: Transient Expression of Fluorescent Fusion Proteins in Protoplasts

学习植物细胞的液体培养，原生质体纯化，电转法进行基因转化，荧光融合蛋白在细胞器中表达，理解蛋白的亚细胞定位。

Maintenance and subculture of suspension cultured cells & Protoplast generation and purification & Transformation of protoplasts by DNA via electroporation & Study of the expressed fluorescent fusion proteins in organelles & Understanding the correlation between the subcellular localization of proteins and their biological function.

NO.10 实验 14 (4h)

实验 14: 水培法进行植物缺素症状的检测

Experiment 14: Nutrient Deficiency Symptoms Determination by Hydroponics

理解植物生长所需的必需营养元素，通过水培法观察和理解植物的缺素症状。

To understand the essential nutrients for plant growth & observe and understand deficiency symptoms associated with inadequate supplies.

NO.11 实验 15 (4h)

实验 15: 植物组织水势的检测 (小液流法、露点法)

Experiment 15: Determination of Water Potential in Plant Tissue (Chardakov Method & Dew Point Method)

学习植物水势的基本知识, 用小液流法和露点法检测植物组织的水势。

To understand the basic knowledge about water potential & determine water potential in plant tissue.

NO.12 实验 16、17 (4h)

实验 16: 植物组织中丙二醛的检测

Experiment 16: Measurement of Malondialdehyde in Plant Tissues

学习叶片中丙二醛的提取, 利用分光光度计进行丙二醛含量的检测。

To extract the Malondialdehyde in leaves & test the content of Malondialdehyde with spectrophotometry.

实验 17: 植物细胞膜透性检测

Experiment 17: Determination of Plant Cell Membrane Permeability

理解植物逆境条件下膜透性的变化, 检测植物的膜透性。

To understand the changes of cell membrane permeability when plants meet stress & test the plant cell membrane permeability.

NO.13 实验 18 (4h)

实验 18: 超氧化物歧化酶 SOD 酶活性检测

Experiment 18: Enzymatic Activity Determination of Superoxide Dismutase SOD

学习逆境条件下植物的生理反应, 学习 SOD 酶活性的检测。

To learn the basic physiological effects of stress & learn how to measure the enzymatic activity of SOD.

NO.14 课程回顾(4h)

Course review(4h)

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

本实验目前不指定教材和参考书。

实验 manual 由课程的负责老师、工程师、实验员共同编写。

### 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		25		
小测验 Quiz		15		
课程项目 Projects				
平时作业 Assignments		30		
期中考试 Mid-Term Test				
期末考试 Final Exam		30		
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.