

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	动物生理学实验 Animal Physiology Laboratory
2.	授课院系 Originating Department	生物系 Department of Biology
3.	课程编号 Course Code	BIO313-15
4.	课程学分 Credit Value	2
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	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)	生悦, 生物系, shengy@sustech.edu.cn Sheng Yue, Department of Biology, Email: shengy@sustech.edu.cn 赵颖岚, 生物系, zhaoyl@sustech.edu.cn Zhao Yinglan, Department of Biology, Email: zhaoyl@sustech.edu.cn 吕沫, 生物系, lv.m3@sustech.edu.cn Lv Mo, Department of Biology, Email: lv.m3@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	林飏, 生物系, linb3@sustech.edu.cn Lin Biao, Department of Biology, Email: linb3@sustech.edu.cn
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	24

11. 授课方式 Delivery Method	讲授	习题/辅导/讨论	实验/实习	其它(请具体注明)	总学时
	Lectures	Tutorials	Lab/Practical	Other (Please specify)	Total
学时数 Credit Hours			课堂实验 63 学时 Class experiment 63 h	课后实验观察 1 学时 Observation after class 1 h	64
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	要求先修《普通生物学实验》课程；学习本实验课的同时学习《动物生理学》或者《生理学与病理生理学》理论课课程。 Pre-study General Biology Laboratory, and study the theory courses Animal Physiology or Physiology and Pathophysiology with the experiments course at the same time.				
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.	None 无				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

动物生理学是一门实验性学科，实验在生理学的课程学习中占有十分重要的作用。本课程主要以活体动物或具有生物学活性的材料为研究对象，采取急性离体和在体实验的实验方法，验证动物生理学的基本理论。通过动物生理学实验教学，使学生了解使用动物进行实验的必要性，掌握动物伦理及动物福利；掌握动物实验的规范操作和基本实验技术；提高学生的动手能力、应变能力、观察、分析和解决问题能力；培养学生的创新思想、严谨治学和团队合作意识。

Animal physiology is the experimental discipline, animal physiology laboratory plays an important role in course learning. Animals and tissues are used in the course. Several in vitro and in vivo experiments are designed to examine the physiological function of animals. Students will understand why we should use animals in scientific research. More importantly, they should know animal ethics and animal welfare. The course can improve students' practical ability, train ability, observation ability and abilities to analyze and solve problems. It can also develop the students' innovative thinking, rigorous scholarship and team work consciousness.

16. 预达学习成果 Learning Outcomes

1. 学生将掌握动物实验的常规仪器使用，如：血压计、麻醉机、恒温平滑肌槽、脑立体定位仪等。
2. 学生将掌握动物实验的基本实验技术，如：动物抓取、固定、麻醉、灌胃、静脉注射及手术打结等。
3. 学生将掌握动物生理学实验常用标本的制备方法，如：坐骨神经-腓肠肌标本的制备，离体心脏的制备，小肠平滑肌标本的制备；
4. 学生将掌握动物生理指标的检测方法，如：血压、血糖、心电图的检测；
5. 学生将掌握实验常用的动物疾病模型制备方法，如：小鼠糖尿病模型及大鼠心律失常模型的建立。
6. 通过本课程的学习，使学生更好的理解动物的生理功能及其调节机制。

1. Students will master the use of basic experimental equipments: sphygmomanometer, anaesthesia machine, thermostat smooth groove, stereotaxic apparatus, etc.

2. Students will master the basic experimental techniques: handling, restraint, anaesthesia, intragastric administration, intravenous injection, knot-tying technique, etc.

3. Students will master the methods of preparing tissue samples: preparation sample of sciatic nerve- gastrocnemius muscle, frog heart in vitro, mammal's small intestine in vitro.

4. Students will master the test methods of animal physiological indexes: blood pressure, blood glucose, ECG, etc.

5. Students will master how to establish animal models of human disease: establishment of streptozotocin (STZ)- induced diabetes model in mice, BaCl₂- induced heart arrhythmia model in rats.

Students will get better understanding about the animal physiological function and regulation mechanisms.

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.)

一、动物生理学实验简介及动物伦理

学时：4 学时

Lab 1 Introduction to animal physiology laboratory & Animal Ethics

Hours: 4 h

介绍动物生理实验安全管理制度，了解课程要求、课程评估方式、课程内容及时间安排等。介绍动物伦理及动物福利。

Introduce animal physiology laboratory safety, course requirement, course evaluation, course content and schedule. Introduce the animal ethics and animal welfare.

二-三、人体生理学实验

学时：8 学时

Lab2-3 Human Physiology Experiment

Hours: 8 h

人体生理与动物生理极为相似，因此其往往作为生理学的入门课程。本实验学生将进行一系列人体实验，包括血压测量、心电图描记、呼吸运动描记、脑电图描记、肺活量检测、反应实验及感觉实验等。通过实验更好的理解动物生理实验及动物福利。

Human physiology is a useful introduction to physiology. Most aspects of human physiology are closely homologous to corresponding aspects of animal physiology. In this lab, serious physiology exercises will be performed by the students carefully following the protocols, including blood pressure measurement, ECG, respiratory movement tracing, brain wave monitoring, lung volume measurement, reaction test, sensory test, etc. You will have a better understanding of animal physiology experiments and welfare.

四、动物实验基本实验技术介绍

学时：5 学时

Lab 4 Basic Techniques of Animal Experiment

Hours: 5 h

本实验学生将学习动物实验基本实验技术，包括动物抓取、固定、麻醉、灌胃、皮下注射、腹腔注射、肌肉注射、止血及手术打结技术。

Learn the basic technical methods for animal experiments, such as animal grabbing, fixation, anesthesia, intragastric administration, subcutaneous injection execution, intraperitoneal injection, intramuscular injection, hemostasis and knot-tying technique.

五、链脲佐菌素诱导小鼠糖尿病模型的建立及糖耐量实验

学时：5 学时

Lab 5 Glucose Tolerance Test in the Treatment of Streptozotocin-Induced Diabetes in Experimental Mice Hours: 5 h

本实验学生将学习链脲佐菌素诱导小鼠糖尿病模型的建立方法。通过体重检测及糖耐量实验，筛选造模成功的糖尿病小鼠。本实验有助于学生更好的理解糖尿病的发生机制。

Study the establishment of streptozotocin (STZ)- induced experimental diabetic model in mouse. By measure the body weight and test the glucose tolerance, screen the successful diabetic mice and understand more about the physiological process of diabetes and underlying mechanisms.

六、神经-肌肉活动

学时：4 学时

Lab 6 Nerve-Muscle Activity

Hours: 4 h

本实验学生将学习组织和神经的分离方法。通过对蛙坐骨神经的直接电刺激确定蛙腓肠肌的阈刺激及最适刺激强度。记录不同刺激强度及刺激频率对肌肉收缩的影响。描记单收缩、不完全强直收缩及完全强直收缩曲线。

Learn how to separate the tissue and nerve, to determine the threshold voltage and optimum stimulus intensity for frog muscle contraction when stimulated directly through the sciatic nerve. Record the effects of stimulus strength and stimulus frequency on muscle contractility. Trace the single twitch, partial tetanus and fused tetanus.

七、蛙坐骨神经干动作电位的引导

学时：5 学时

Lab 7 The Nerve Trunk Action Potential of Frog Sciatic Nerve

Hours: 5 h

本实验学生将学习坐骨神经-腓肠肌标本的制作方法。记录神经干动作电位单向及双向动作电位曲线，测量神经干不应期时长及神经传导速度。

Learn how to prepare the sciatic nerve- gastrocnemius muscle, to use the in vitro frog muscle preparation to observe the action potential of nerve trunk. Record the monophasic and biphasic action potential. Measure the the refractory period and conducting speed of nervous trunk action potential.

八、期前收缩与代偿间歇

学时：5 学时

Lab 8 Extra Systole and Compensatory Pause

Hours: 5 h

本实验学生将学习心脏的分离方法。通过对蛙心电刺激确定心肌收缩的有效不应期和相对不应期，并与骨骼肌比较。记录电刺激的心肌收缩曲线，描记蛙心的期前收缩和代偿间歇。

Learn how to separate the frog heart, to determine the effective refractory period and relative refractory period of frog heart contraction and compare with the muscle contraction. Record the heart beat curve of the stimulate reaction and learn the formation of extra systole and compensatory pause.

九、蛙心灌流

学时：5 学时

Lab 9 Perfusion of Frog Heart

Hours: 5 h

本实验学生将学习离体蛙心的制备方法。通过给予不同药物探讨钠离子、钾离子、钙离子、PH 和神经递质对心脏收缩活动的影响。

Learn how to prepare the in vitro frog heart sample with active physiology function, to determine influences of sodium, potassium, calcium, pH, and neurotransmitters on the activities of the heart contraction.

十、小肠平滑肌的生理特性

学时：5 学时

Lab 10 Smooth Muscle Motility

Hours: 5 h

本实验学生将学习哺乳动物小肠平滑肌离体样本的制作方法，并检测不同处理因素对平滑肌生理活动的影响。

Learn how to prepare mammal's small intestine in vitro, to determine effect of hormones on smooth muscle motility.

十一、BaCl₂ 诱导大鼠心律失常模型的制备

学时：5 学时

Lab11 BaCl₂-Induced Heart Arrhythmia in Experimental Rats

Hours: 5 h

本实验学生将学习 BaCl₂ 诱导大鼠心律失常模型的建立方法。通过心电图监测，筛选造模成功的心律失常大鼠。本实验有助于学生更好的理解心律失常的发生机制。

Study the establishment of BaCl₂- induced experimental cardiac arrhythmias model in rat. By measure the electrocardiogram(ECG), screen the successful arrhythmias rats and understand more about the physiological process of cardiac arrhythmias and underlying mechanisms.

十二、小鼠脑立体定位技术

学时：5 学时

Lab 12 Mouse Stereotaxic Surgery

Hours: 5 h

本实验学生将学习脑立体定位技术，应用三维操作系统对动物脑组织特定部位进行给药处理。学生将在小鼠侧脑室注射台盼蓝染液，通过振动切片机获得脑组织切片，观察脑脊液循环生理现象。

Learn the technique of stereotaxic surgery, a three-dimensional coordinate system, utilized to manipulate the targeted regions within brain in living animals. Students will inject the Typan blue to the lateral ventricle of mouse. Then get slices of brain tissue with vibratome and observe the phenomenon of cerebral spinal fluid circulation.

十三、血液凝固的影响因素

学时：4 学时

Lab 13 Influences on Blood Coagulation

Hours: 4 h

本实验学生通过比较不同处理因素的凝血时间，了解加速及阻滞血液凝固的影响因素。学生也将检测家兔血液的血红蛋白含量及血沉，理解血液的生理功能。

By measuring clotting time under different conditions, understand different factors accelerating or delaying blood clotting. Students will also measure the hemoglobin concentration and erythrocyte sedimentation rate, understand the physiological function of blood.

十四、实验回顾与总结

学时：4 学时

Lab14 Lab review

Hours: 4 h

学生总结本课程的实验内容并进行拓展，通过 PPT 以演讲的形式进行讲解。

The students will summary the lab course by themselves and expand the mind. They will do the presentation with PPT.

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

教材由课程的负责老师、工程师共同编写。

Manual is written by teachers and engineers in charge of the course.

参考资料：

Experiments in Physiology. David A. Woodman and Gerald D. Tharp

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		10		动物伦理 (animal ethics)

小测验 Quiz			
课程项目 Projects			
平时作业 Assignments	20		notebook
期中考试 Mid-Term Test			
期末考试 Final Exam			
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)	60		Experimental operation 20% Report 30% Presentation 10%

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.

