

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	极端环境生命过程野外实习 Field Trip of Life in Extreme Environments				
2.	授课院系 Originating Department	海洋科学与工程系 Department of Ocean Science and Engineering				
3.	课程编号 Course Code	OCE472				
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	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)	张传伦 海洋科学与工程系 创园9栋603 0755-88018785 Prof. Chuanlun Zhang Department of Ocean Sciences and Engineering Chuangyuan-9-603 0755-88018785				
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	郭静 海洋科学与工程系 创园9栋603 0755-88018796 Ms. Jing Guo Department of Ocean Sciences and Engineering Chuangyuan-9-603 0755-88018796				
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	15				
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			104		104

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	OCE308 微生物海洋学 Microbial Oceanography or OCE 411 极端环境生命过程 Life in Extreme Environments
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	
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

本次实习安排在腾冲热海地区。通过本次实习，同学们将在课堂上所学的理论知识与野外极端环境结合起来，加深对专业知识的理解，对极端环境生命有一个系统性地认识，学会热泉水样和沉积物样品采集，理化参数测定，分离和纯化热泉微生物；系统地开展热泉微生物资源的分离与培养研究，探索热泉微生物资源的利用潜力为提高极端微生物领域的研究水平做贡献。

This filed trip was arranged in the hot sea area of Tengchong. Through this filed trip, the students combine the theoretical knowledge that they have learned in the classroom with the extreme environment, deepen their understanding of professional knowledge, have a systematic understanding of extreme environmental life, and learn to collect hot spring water samples and sediment samples, determination of the physical and chemical parameters, isolation and identification of spring microorganism. Systematically studying on the separation and culture of hot spring microbial resources. Exploring the potential of microbial resources in hot springs to contribute to the research level in the field of extreme microbiology.

16. 预达学习成果 Learning Outcomes

通过本次实习，使学生具备下列基本技能：

- 1、将书本上的知识运用在实践中。培养理论联系实际的作风，学会认识实习区的各种热泉等，掌握它们的主要特征；
- 2、学会野外采样记录、热泉的描述、进行热泉样品理化参数测定等知识；
- 3、进行野外热泉水与沉积物样品的采集，学会野外样品采集工作的基本步骤、程序和方法，以便能独立地进行野外样品研究工作；
- 4、学会沉积物和水样 DNA 提取、扩增和纯化，利用高通量数据分析热泉水体和沉积物微生物群落；
- 5、学会分离及纯化、菌种保藏，以及热泉微生物 DNA 提取，基因序列扩增与测序等基因组学方法，
- 6、通过对野外特殊的、有意义的极端环境现象的观察、分析和研究，结合实验室内实验，系统地开展热泉微生物资源的分离与培养研究。

1. Apply the knowledge in books to practice. Cultivate the theory and practice style, learn to understand the various hot springs in the field, and master their main characteristics;
2. Learn the field sampling records, the description of hot springs, and the determination of physical and chemical parameters of hot spring samples;
3. Collect of hot spring water and sediment samples in the field, and learn the basic steps, procedureds and methods for field sample collection work, so that field sample research can be carried out independently;
4. Learn to extract, amplify and purify sediment and water samples, and analyze high temperature soils and sediment microbial communities using high-throughput data;
5. Learn genomics methods such as separation and purification, strain preservation, hot spring microbial DNA extraction, gene sequence amplification and sequencing,
6. Through the observation, analysis and research of special and meaningful extreme environmental phenomena in the field, combined with laboratory experiments, systematically carry out research on the separation and cultivation of hot spring microbial resources.

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.)

第一天：出发前在南科大实验室：学习腾冲热海地区地质与极端环境下微生物相关的知识，实习期间的注意事项、具体安排，进行野外实验的准备工作。（8学时）

Day 1: Before the departure, at Chuangyuan 9-604 of SUSTech: Studying the knowledge of microorganisms in the extreme environment and the geology of Tengchong Rehai area, the precautions and arrangements during the field trip, and the preparation for field experiments. (8 credit hours)

第二天：从深圳出发抵达腾冲机场，住宿腾冲市区，熟悉实习总体路线、强调注意事项，分配小组，整理分配实习所需野外物资。（8学时）

Day 2: Department from Shenzhen to Tengchong Airport, stay in Tengchong town, be familiar with the overall route of the field trip, emphasize the precautions, assign the team, and arrange the materials needed for experiments. (8 credit hours)

第三天：上午出发去热海实习区域，全面了解采样区概况，熟悉采样具体地点，总共 30 个取样点。下午主要集中在地热体验区，分组测量热泉水体的原位理化性质，比如温度、pH、TDS 等，选择对应的热泉进行样品采集。晚上回来准备实习物资，住宿腾冲县。（8学时）

Day 3: Arrive at Rehai in the morning, get a comprehensive overview of the sampling area, familiar with the sampling location, a total of 30 sampling areas. In the afternoon, the main task is the Drty Area. The in-situ physical and chemical properties of the hot spring water are measured in groups, such as temperature, pH, TDS, etc., and sample collection. Come back in the evening to prepare for field trip. (8 credit hours)

第四天：上午在地热体验区（Drty）和大滚锅（Dgg）过滤水样，每个点过滤热泉水 5L，收集浓缩液 2L，保存滤膜样品；下午利用哈希试剂盒野外测定地热体验区和大滚锅（Dgg）的样品点的其他参数，包括溶解氧浓度(DO)、亚铁离子浓度、硫化氢浓度、硝态氮、铵态氮、碱度、和二氧化硅含量。晚上回来准备实习物资，住宿腾冲县。（8学时）

Day 4: In the morning, filter the water sample in the Drty and the Dgg. Filter 5L of the hot spring water at each point, collect 2L of the concentrate, and store the filter sample. In the afternoon, use the hash kit to measure other parameters, such as dissolved oxygen concentration (DO), ferrous ion concentration, hydrogen sulfide concentration, nitrate nitrogen, ammonium nitrogen, alkalinity, and silica content, et al. Come back in the evening to prepare for field trip. (8 credit hours)

第五天：上午在怀胎井(Htj)、姐妹泉(Jmq)、鼓鸣泉(Gmq)和珍珠泉(Zzq)进行水样和沉积物样品的采集；过滤水样，保存膜样品；下午利用哈希试剂盒野外测定 Htj, Jmq, Gmq and Zzq 样品点的其他参数，包括溶解氧浓度(DO)、亚铁离子浓度、硫化氢浓度、硝态氮、铵态氮、碱度、和二氧化硅含量。晚上回来准备实习物资，住宿腾冲县。其中鼓鸣泉（Gmq）有一条由热泉水流出形成的溪流，水路长 3 米，每隔约 1 米采集一个样品，分别为热泉泉口（Gmq S），中游（Gmq C）和下游（Gmq P）。（8学时）

Day 5: Collection of water samples and sediment samples in Htj, Jmq, Gmq and Zzq in the morning; filter water samples and preserve film samples; In the afternoon, use the Hash Kit to determine parameters of Htj, Jmq, Gmq and Zzq, including dissolved oxygen concentration (DO), ferrous ion concentration, hydrogen sulfide concentration, nitrate nitrogen, ammonium nitrogen, alkali Degree, and silica content. Come back in the evening to prepare for field trip. Among them, Gmq has a stream formed by hot spring water. The water path is 3 meters long. A sample is collected every 1 meter, which is the hot spring mouth (Gmq S), the middle reaches (Gmq C) and the downstream (Gmq). P). (8 credit hours)

第六天：上午在水热爆炸（Srbz）和地热池（Drc）进行样品采集和参数测定。选择另外一条由热泉水流出形成的溪流（从源头到下游），沿着水流方向有很好的温度梯度。此条条位于 Drc，水路长约 8 米（共 7 个点），着水路测量了温度、pH 和电导率值，进行样品的采集与分析。（8学时）

Day 6: Sample collection and parameter determination in the hydrothermal explosion (Srbz) and geothermal pool (Drc) in the morning. Choose another stream that flows out of hot spring water (from source to downstream) with a good temperature gradient along the direction of the water flow. This strip is located in Drc. The waterway is about 8 meters long (7 points in total). The temperature, p H and conductivity values are measured on the waterway for sample collection and analysis. (8 credit hours)

第七天：去腾冲火山地质公园在大小空山、柱状节理和黑鱼河三地方采集火山微生物样品。晚上整理和邮寄样品。(8 学时)

Day 7: Go to the Tengchong Volcanic Geopark to collect samples of volcanic microorganisms in the three places, such as large and small mountains, columnar joints and black fish rivers. Mail samples at night. (8 credit hours)

第八天：搭飞机返回深圳。

Day 8: Package and return to Shenzhen by plane.

第九天：整理野外样品与物资，样品进行入库登记，保存。配备热泉微生物的分离与培养的培养基。(8 学时)

Day 9: Organize the field samples and materials, and samples are stored. Preparation of Culture medium. (8 credit hours)

第十天：样品的处理与分离培养实验。(8 学时)

Day 10: Sample processing and separation culture experiments. (8 credit hours)

第十一天：热泉沉积物和水样 DNA 提取实验。(8 学时)

Day 11: DNA extraction of sediments and water samples from hot springs. (8 credit hours)

第十二天：热泉沉积物和水样扩增和纯化，pPCR 实验。(8 学时)

Day 12: PCR, qPCR and purification of sediments and water samples from hot springs(8 credit hours)

第十三天：纯化菌株的不同保藏方法。(8 学时)

Day 13: Different preservation methods for purified strains. (8 credit hours)

第十四天：纯化菌株基因组 DNA 的提取，16S rRNA 基因的 PCR 扩增及测序。(8 学时)

Day 14: Extraction of genomic DNA, PCR amplification and sequencing of 16S rRNA gene from purified strain. (8 credit hours)

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

Extremophiles: Where It All Began. Authors: Horikoshi, Koki. 2016. ISBN 978-4-431-55408-0

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		0		
课堂表现 Class Performance		0		
小测验 Quiz		0		
课程项目 Projects		0		

平时作业 Assignments	0		
期中考试 Mid-Term Test	0		
期末考试 Final Exam	0		
期末报告 Final Presentation	100		
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

海洋科学与工程系本科教学委员会
 Department of Ocean Science and Engineering Undergraduate Committee

