

ESE412 课程大纲

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- 2、2018 秋季学期 —— 2023 秋季学期 5-8 页

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	生态修复 Ecological Restoration
2.	授课院系 Originating Department	环境科学与工程学院 School of Environmental Science and Engineering
3.	课程编号 Course Code	ESE 412
4.	课程学分 Credit Value	3
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	中文 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)	杨丽红，环境科学与工程学院， yanglh@sustech.edu.cn . Lihong Yang, School of Environmental Science and Engineering, SUSTech
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	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	44		4	N/A	48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	N/A				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	N/A				
14. 其它要求修读本课程的学系 Cross-listing Dept.	N/A				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

生态文明建设是我国当前最重要的大政方针之一，生态修复是贯彻这一方针的重要内容，因此，本课程将结合我国生态修复领域发展现状，以及当前最新的生态修复理论框架，为学生讲解开展生态修复的基本概念、技术体系、规划和管理要点等，以及几个重点的生态修复领域和相关案例，包括水生态环境修复、土地复垦及土壤修复、矿区生态修复与绿色矿山。作为课程拓展，介绍当前国内生态修复领域热点，山水林田湖草沙一体化保护和系统治理（全国重要生态系统保护和修复重大工程）、生态导向开发（EOD）的生态修复新模式及绿色金融、可持续生态修复未来展望，进一步拓宽学生的视野。

The construction of ecological civilization is a fundamental policy in current China. Ecological restoration is one of the most important approaches. This course provides a broad overview of the development stages of ecological restoration in China, the theoretical framework about modern ecological restoration, the highlights in planning and management of ecological restoration projects, and typical case studies including aquatic ecosystem, terrestrial ecosystem, mining area. As an extension, this course will introduce the state-of-art ecological restoration patterns and trend in China, including the major projects for the protection and restoration of national key ecosystems, the EOD framework, the green finance and the future outlook related to ecological sustainability.

16. 预达学习成果 Learning Outcomes

本门课程通过讲座、短视频、实地调查、小组讨论、个人演讲和学期论文等方式，使学生：1）掌握生态修复的理论基础和生态修复的技术及工程体系；2）掌握主要生态修复领域的修复原则与主要方法（水生态系统、陆地生态系统、矿区生态系统）；3）了解我国当前生态修复热点领域与发展趋势。

Through lectures, short videos, field survey, group discussion, individual presentations and term paper, this course will provide students: 1) the theoretical basis of ecological restoration and the highlight of planning and management of ecological restoration projects; 2) the major ecological restoration cases (water ecosystem, contaminated soil, degraded or abandoned land, mining sites); 3) the developing trend in future.

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.)

第一章 绪论 Chapter1 Introduction (2hr)

- 1.1 经济发展与环境退化 Economy development and environmental degradation
- 1.2 生态修复的概念与目标 The concepts and the goal of ecological restoration
- 1.3 生态修复的原则与步骤 The principal and stages in ecological restoration
- 1.4 我国生态修复领域发展趋势 The trend of ecological restoration in China

第二章 生态修复理论基础 Chapter2 The theory in ecological restoration (6hr)

- 2.1 生态修复的生态学理论 The ecological theory in ecological restoration
- 2.2 生态系统服务功能与价值 The service functions and values of ecosystem

第三章 生态修复技术与工程实施框架 Chapter3 The technology and engineering framework of ecological restoration (8hr)

- 3.1 生态修复策略 The strategy in ecological restoration project
- 3.2 生态调查与评价 Methodology and procedure of investigation and monitoring
- 3.3 生态修复项目规划设计 Planning and design for ecological restoration
- 3.4 生态修复的工程技术 Technologies in ecological restoration engineering project
- 3.5 项目管理与绩效评估 Project management and performance evaluation

第四章 水生态系统修复 Chapter4 Water ecological restoration (8hr)

- 4.1 河流生态系统恢复与水环境修复 River ecosystem restoration and water environmental restoration
- 4.2 湖泊生态系统的修复 Lake ecosystem restoration and water environmental restoration
- 4.3 湿地生态系统恢复 Wetland restoration
- 4.4 海岸带生态系统的修复 Estuary ecological restoration
- 4.5 案例学习 Case study

第五章 土地复垦及土壤修复 Chapter5 Reclamation and soil remediation (8hr)

- 5.1 退化污染废弃土地的成因 The formation of degraded , contaminated, and abandoned land
- 5.2 土地退化及复垦 Land deterioration and reclamation
- 5.3 污染土壤修复 Soil contamination and remediation
- 5.4 废弃土地的生态修复 Ecological restoration on abandoned land
- 5.5 案例学习 Case study

第六章 矿区生态修复 Chapter6 (6hr)

- 6.1 矿山开采与生态环境破坏 Mining activities and ecological destroy
- 6.2 矿区污染控制技术 Contamination control technologies for mining sites
- 6.3 绿色矿山与可持续发展 Green mine and sustainable mining strategy
- 6.3 废弃矿山修复与开发案例分析 Case studies about remediation and development of abandoned mine

第七章 生态环境保护与修复 Chapter7 (6hr)

- 7.1 全国重要生态系统保护和修复重大工程 Major projects for the protection and restoration of national key ecosystems
- 7.2 EOD 模式与绿色金融 The Environmental Oriented Development and green finance
- 7.3 可持续生态修复的未来展望 The future outlook on sustainable ecological restoration

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

1. Palmer MA, Zedler JB, Falk DA, 2016. Foundations of Restoration Ecology, 2nd Ed. Island Press, Washington.
2. 生态修复学导论, 刘俊国, 安德鲁·克莱尔, 科学出版社, 2022。
3. 生态修复理论与技术 (第2版), 刘冬梅, 哈尔滨工业大学出版社, 2020。
4. 国土空间生态修复, 吴次芳等, 地质出版社, 2021。

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	N/A	0%		
课堂表现 Class Performance	N/A	10%		
小测验 Quiz	N/A	0%		
课程项目 Projects	N/A	55%		包括计划书 (10%) + 进展报告 (10%) + 学期报告 (35%)
平时作业 Assignments	N/A	15%		课外实践考察报告
期中考试 Mid-Term Test	N/A	0%		
期末考试 Final Exam	N/A	0%		
期末报告 Final Presentation	N/A	20%		课堂口头汇报学期报告内容, 约 20 分钟
其它 (可根据需要改写以上评估方式) Others (The above may be modified as necessary)	N/A	0%		

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

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。

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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
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)	Ming Hung Wong, Xunwen Chen, School of Environmental Science and Engineering, SUSTech. wongmh@sustech.edu.cn , chenxw3@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
学时数 Credit Hours	40	4	4	N/A	48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	N/A				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	N/A				
14. 其它要求修读本课程的学系 Cross-listing Dept.	N/A				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

This course provides a broad overview of the interdisciplinary topic of ecological reclamation of organic wastes and degraded habitats. It explores how ecological reclamation techniques can be used to convert different organic wastes into valuable products; decontaminate and restore different contaminated/disturbed habitats, including soil and water.

The first part is related to degradation of natural resources due to human activities, and the impacts on the environment and human health, with emphasis on major food contaminants. The second part reviews the basic principles of ecological restoration, and techniques commonly employed for ecological survey, restoration and toxicity analyses. The third part examines various techniques, through the use of various microbes, for converting different organic wastes into food, fertilizer, feed and fuel. The recent advances on turning organic waste into biochar is also included. The fourth part describes the common reclamation methods adopted for restoring man-made and contaminated habitats. The basic principles of soil science and the important components (i.e. plants, microbes and organic matter) for successful ecological restoration are presented. Case studies related to bioremediation and phytoremediation of contaminated soil and water are provided. Revegetation and stabilization of completed landfills and slopes are also illustrated. Finally, the fifth part is the conclusion on future prospects related to ecological sustainability.

16. 预达学习成果 Learning Outcomes

Students will be introduced to the rapidly expanding discipline of recycling of organic wastes and restoring degraded ecosystems; through lectures, short videos, field survey, group discussion, individual presentations and reflective essays. It is hoped that the students can apply theory learnt to the implementation of waste treatment and recycling, and habitat decontamination and restoration.

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.)

COURSE OUTLINE (MH: Ming Hung Wong, XW: Xunwen Chen)

1. Human population growth and impacts
 - 1.1 Environmental degradation – MH 2.5h
 - 1.2 Exposure of pollutants and health impacts – MH 2.3h
 - 1.3 Writing scientific paper – MH 3h

2. Ecological restoration
 - 2.1 Introduction to ecological restoration- XW 1h
 - 2.2 Methodology and concepts in ecological restoration – XW 3h
 - 2.3 Basic ecotoxicology – XW 3h

Ecological survey: application of techniques (related to restoration) – XW 4h

3. Reclamation of biological wastes
 - 3.1 Food, fertilizer, feed – MH 4h
 - 3.2 Fuel, biochar – XW 3h

4. Restoration of degraded and man-made habitats
 - 4.1 Basic soil properties – MH 2h
 - 4.2 Basic components for restoration: Plants, microbes, organic matter – MH 2h
 - 4.3 Bioremediation of contaminated sites– MH 2h
 - 4.4 Phytoremediation of contaminated sites – MH 4h
 - 4.5 Constructed wetlands for water purification and biological conservation – MH 4h
 - 4.6 Ecological restoration of completed landfills – XW 3h
 - 4.7 Revegetation of slopes – XW 3h

5. Future prospects on ecological sustainability – MH 2h

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

1. Cunningham WP, Cunningham MA, 2009. Environmental Science: A Global Concern, 11th Ed. McGraw-Hill, NY.
2. Lehmann J, Joseph S, 2009. Biochar for Environmental Management: Science and Technology, Routledge, London.
3. Midgley GF, 2012. Biodiversity and ecosystem function. Science 335, 174–175.
4. Miller GT, Spoolman SE, 2008. Essentials of Ecology, 5th Ed. Cengage Learning, Belmont.
5. Palmer MA, Zedler JB, Falk DA, 2016. Foundations of Restoration Ecology, 2nd Ed. Island Press, Washington.
6. Schulze ED, Beck E, Müller-Hohenstein K, 2005. Plant Ecology. Springer, NY.
7. Walker CH, Sibly RM, Hopkin SP, Peakall DB, 2012. Principles of Ecotoxicology, 4th Ed, CRC Press, Boca Raton.
8. Wong MH, 2013. Environmental Contamination, Health Risks and Ecological Restoration. CRC Press, London,
9. Wong MH, 2004. Wetlands Ecosystems in Asia: Function and Management. Elsevier, London,
10. Wong MH, Bradshaw AD, 2002. The Restoration and Management of Derelict Land: Modern Approaches. World Scientific, London.

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	N/A	10%		
课堂表现 Class Performance	N/A	0%		
小测验 Quiz	N/A	0%		
课程项目 Projects	4 h	30%		
平时作业 Assignments	N/A	0%		
期中考试 Mid-Term Test	N/A	20%		
期末考试 Final Exam	2 h	40%		
期末报告 Final Presentation	N/A	0%		
其它（可根据需要 改写以上评估方式） Others (The above may be modified as necessary)	N/A	0%		

Southern University
of Science and
Technology

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