南方科技大学
SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

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**	新能源工程综合实验 Comprehensive Experiment for Energy Engineering
2.	**授课院系** **Originating Department**	机械与能源工程系 Department of Mechanical and Energy Engineering
3.	**课程编号** **Course Code**	ME486
4.	**课程学分 Credit Value**	2
5.	**课程类别** **Course Type**	专业选修课 Major Optional Courses
6.	**授课学期** **Semester**	秋季 Fall
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）**	魏磊，副教授，机械与能源工程系 Email：weil@sustech.edu.cn Lei Wei, Associate Professor, Department of Mechanical and Energy Engineering, Email：weil@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）**	30

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			64		64

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	
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

1. 介绍光电转换原理实验以及实际操作；

   Introduce the principle experiment and practical operation of photoelectric conversion.

2. 介绍电化学界面反应原理以及基本实验操作；

   Introduce the principle of electrochemical interfacial reaction and essential experimental operation.

3. 介绍电化学电池原理以及基本实验操作；

   Introduce the principle of electrochemical cells and essential experimental operation.

4. 通过实验操作，了解光电转化、电化学转化、储能的基本实验流程、数据收集以及分析整理；

   Through the experimental operation, understand the basic experimental process, data collection, and photoelectric and electrochemical conversion analysis.

16. 预达学习成果 Learning Outcomes

新能源工程实验专业选修课程，通过光电转化、光电化学转化以及电化学转化若干个实验，给学生以基本的实验操作、数据收集以及原理分析、总结归纳实验现象的能力，为其进一步开展新能源综合实验打下良好基础。

"Experiment for Energy Engineering" is an optional course that provides students with the skills necessary for basic experimental operations, data collection, principle analysis, and summarizing experimental phenomena. Through several experiments involving photoelectric conversion, photoelectric chemical conversion, and electrochemical conversion, students will develop a solid foundation for conducting more comprehensive experiments related to new energy.

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.)

Week 1 光电化学及电化学实验基本实验操作介绍

Week 1 Introduction to basic experimental operation of electrochemical experiment.

Week 2-3 三电极体系的认识，电化学常规测试方法和数据分析

Week 2-3 Understanding of three electrode system, routine electrochemical test method and data analysis

Week 4 阴极极化曲线的测量以及数据分析整理

Week 4 Measurement of cathodic polarization curve and data analysis.

Week 5 电镀铜实验，以及数据分析整理

Week 5 Copper electroplating experiment and data analysis.

Week 6 光电池/探测器光电转化实验：光电流，光电压，电压电流曲线，光强与光电压关系，光强与光电流的关系

Week 6 Photon to electricity transition: photocurrent, photovoltage, current-voltage curve, relationship of intensity vs photovoltage, relationship of intensity vs current.

Week 7 光电化学转化实验：光电化学电池构建，电解质，CV 曲线，光电化学电压电流曲线，产物分析

Week 7 Photoelectrochemical Conversion: Construction of photoelectrochemical cell; Electrolyte preparation, CV Curve, Photocurrent-voltage curve, product analysis

Week 8 期中考试周，复习电化学和光电化学转化理论知识

Week 8 Mid-term exam Week, review the theoretical knowledge of electrochemical and photoelectrochemical conversion.

Week 9-10 锂离子电池组装与性能测试实验：电池组装，EIS 谱，CV 曲线，LEDs 灯展示

Week 9-10 Lithium ion battery assembly and performance testing experiment: battery assembly; EIS spectra; CV curves; LEDs light display

Week 11-12 水系锌离子对称电池组装与电化学性能测试实验：电池组装，EIS 测试，CV 曲线，电池拆解

Week 11-12 Experimental study on assembly and electrochemical performance testing of water-based zinc ion symmetric batteries: battery assembly, EIS testing, CV curves，Battery disassembly

Week 13-14 全钒液流电池组装，电堆组装与电化学性能测试实验：电池组装，EIS 测试，CV 曲线，电池拆解

Week 13-14 Experimental study on assembly and electrochemical performance testing of all vanadium redox flow batteries: Battery assembly, Stack assembly, EIS testing, CV curves，Battery disassembly

Week 15 燃料组装与电化学性能测试实验：电池组装，EIS 测试，CV 曲线，电池拆解，LEDs 灯展示

Week 15 Experimental study on assembly and electrochemical performance testing of fue cell: Cell assembly, Cell disassembly, LEDs light display

Week 16 课程总结

Week 16 Course summary

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

1. A. J. Bard. Electrochemical methods：Fundamentals and Applications, 2nd Ed.（电化学方法-原理和应用），北京：化学工业出版社，2005
2. Carl H. Hamann, Andrew Hamnett, Wolf Vielstich, Electrochemistry 2nd Edition, ISBN-10: 9783527310692, Wiley-VCH; 2nd edition (April 9, 2007)
3. 安德烈斯穆尼奥斯.光电化学太阳能转换系统：分子与电子层面， ISBN： 9787111550426，机械工业出版社，2016
4. 葛武杰. 新能源科学与工程专业实验，ISBN：9787122373427，化学工业出版社，2020

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	Every lecture	20		
课堂表现 Class Performance				
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				
其它（可根据需要改写以上评估方式） Others (The above may be modified as necessary)	实验报告	80		

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