

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	新能源汽车动力电池基础 Advanced Batteries for Electrical Vehicles
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	ME386
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	春季 Spring
7.	授课语言 Teaching Language	中英双语 English & Chinese  Southern University of Science and Technology
8.	授课教师、所属学系、联系方式 Instructor(s), Affiliation & Contact (如属团队授课, 请列明其他授课教师) (For team teaching, please list all instructors)	万佳雨, Jiayu Wan, 机械与能源工程系 MEE, email: wanjy@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	46	2			48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	大学物理下				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

1. 了解当前电动汽车最关键的储能器件-锂离子电池的原理与前世今生； Understand the ubiquitously applied energy storage device — Li-ion battery, its basic principles and history
2. 了解与掌握电化学基础与测试方法，了解人工智能技术在动力电池研发中的应用； Understand fundamentals of electrochemistry and methods; understand the application of AI in battery R&D
3. 掌握各类电池的基础理论与器件结构，了解最前沿的发展方向； Understand basic principle and device structures of various advanced batteries, including related cutting edge technologies.
4. 掌握与训练文献搜索与科研汇报的基本能力。 Practice literature research and presentation skills.

16. 预达学习成果 Learning Outcomes

在国家大力发展“碳达峰，碳中和”的背景下，学生能够了解新能源汽车的重要性，并掌握动力电池研究的起源，发展，基础原理，材料器件，以及最前沿的发展方向，并熟练掌握文献搜索，文献归纳，与科研汇报的基本能力。为将来进入相关企业或在相关领域继续深造做好准备。

In the era of carbon neutralization, the students will understand the importance of transport electrification and learn the fundamentals, origin, development, and cutting edge technologies of electrochemical energy storage devices. They will also learn the basic of literature research, literature organization, and how to do scientific presentations.

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.)

教学内容：本课程将从电化学储能的基本原理与基础出发，介绍电化学电源的起源，发展，各类器件及其优缺点，并探讨该领域的最前沿的研究方向。The course will start with the fundamentals of electrochemical energy storage, introduce the origin of electrochemical energy storage devices, their development, and their advantages and disadvantages. Finally, we will discuss the cutting-edge technologies and research frontiers of this particular field.

1. 新能源汽车与动力电池绪论 (3 学时) Introductions to electrochemical energy storage
2. 电化学电池基础理论-热力学(3 学时) Electrochemical energy storage - thermodynamics
3. 电化学电池基础理论-动力学(3 学时) Electrochemical energy storage - kinetics
4. 电容器简介及其在新能源汽车中的应用(3 学时) Supercapacitors and Pseudocapacitors
5. 燃料电池简介及其在新能源汽车中的应用(3 学时) Introduction to fuel cells
6. 一次电池与二次电池简介(3 学时) Introduction and history of primary and secondary batteries
7. 锂离子电池基础(3 学时)Introduction to Li-ion batteries
8. 电化学测试方法(3 学时) Electrochemical methods
9. 锂离子电池活性材料(3 学时) Active materials in Li ion batteries
10. 锂离子电池非活性材料(3 学时) Passive materials in Li ion batteries
11. 动力电池研发与人工智能应用 (3 学时) Battery R&D with Artificial Intellegence
12. 动力电池系统(3 学时) Battery pack in Electrical Vehicles
13. 进阶课程随堂报告 1 (3 学时) Advanced topics by students' presentations (1)
14. 进阶课程随堂报告 2 (3 学时) Advanced topics by students' presentations (2)
15. 进阶课程随堂报告 3 (3 学时) Advanced topics by students' presentations (3)
16. 进阶课程随堂报告 4 (3 学时) Advanced topics by students' presentations (4)

(随堂报告题目包括：锂离子电池材料与器件，锂硫电池，锌离子电池材料与器件，固态电解质，新型燃料电池，电池人工智能等主题) Final Presentation topics including Li-ion battery materials, Li-S batteries, Solid state batteries, Aqueous electrolytes, Battery AI etc.)

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

1. 《化学电源》（陈新群）第二版
2. Advanced Batteries: Materials Science Aspects. By Robert A. Huggins
3. Electrochemical Methods: Fundamentals and Applications. By Allan J. Bard

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		20		
小测验 Quiz		0		
课程项目 Projects		0		
平时作业 Assignments		0		
期中考试 Mid-Term Test		40		
期末考试 Final Exam				
期末报告 Final Presentation		40		
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