

## 课程大纲 COURSE SYLLABUS

1.	<b>课程代码/名称</b> <b>Course Code/Title</b>	<b>MEE 5410/锂离子电池技术</b> <b>MEE 5410/Lithium Ion Battery Technology</b>
2.	<b>课程性质</b> <b>Compulsory/Elective</b>	专业选修课 Major Elective Courses
3.	<b>开课单位</b> <b>Offering Dept.</b>	工学院机械与能源工程系 Department of Mechanical and Energy Engineering
4.	<b>课程学分/学时</b> <b>Course Credit/Hours</b>	3/48
5.	<b>授课语言</b> <b>Teaching Language</b>	中文 Chinese
6.	<b>授课教师</b> <b>Instructor(s)</b>	李一举, 助理教授, 机械与能源工程系 Yiju Li, Assistant Professor, Department of Mechanical and Energy Engineering
7.	<b>开课学期</b> <b>Semester</b>	秋季 Fall
8.	<b>是否面向本科生开放</b> <b>Open to undergraduates or not</b>	是 Yes
9.	<b>先修要求</b> <b>Pre-requisites</b>	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)  无 N/A
10.	<b>教学目标</b> <b>Course Objectives</b>	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.) <ul style="list-style-type: none"> <li>➤ 掌握锂离子电池的基本概念、发展历史、结构组成、工作原理和技术特点;</li> <li>➤ Master the basic concept, development history, structure, working principle, and technical characteristics of lithium-ion batteries;</li> <li>➤ 掌握锂离子电池正负极、电解液、隔膜的常见类型、优缺点、制备改性及技术发展方向;</li> <li>➤ Master the common type, modification strategy, advantages and disadvantages, and technical development direction of cathodes, anode, electrolytes, and separators of lithium-ion batteries;</li> <li>➤ 掌握扣式电池和软包电池的制备方法以及测试技术;</li> <li>➤ Master the preparation and test technology of coin cells and pouch cells;</li> <li>➤ 掌握新一代锂离子电池的技术发展方向。</li> <li>➤ Master the development direction of new-generation of lithium-ion batteries.</li> </ul>
11.	<b>教学方法</b> <b>Teaching Methods</b>	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)  讲授 Lectures
12.	<b>教学内容</b> <b>Course Contents</b>	

(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)

<b>Week 1</b>	<p>锂离子电池技术简介: 定义、发展历史、组成结构、工作原理、基本概念</p> <p>Introduction to lithium-ion battery technology: definition, development history, composition structure, working principle, and basic concepts</p>
<b>Week 2-3</b>	<p>锂离子电池正极材料: 定义、常见正极材料, 如: 钴酸锂、锰酸锂、磷酸铁锂、三元材料介绍</p> <p>Cathode materials of the lithium-ion battery: definition, common cathode materials, such as <math>\text{LiCoO}_2</math>, <math>\text{LiMn}_2\text{O}_4</math>, <math>\text{LiFePO}_4</math>, <math>\text{LiNi}_{1-x-y-z}\text{Co}_x\text{Mn}_y\text{O}_2</math></p>
<b>Week 4-5</b>	<p>锂离子电池负极材料: 定义、常见负极材料, 如: 钛酸锂、石墨类碳材料、非石墨类碳材料、硅基材料、合金负极材料介绍</p> <p>Anode materials of the lithium-ion battery: definition, common anode materials, such as <math>\text{Li}_4\text{Ti}_5\text{O}_{12}</math>, graphite-like carbon materials, non-graphite-like carbon materials, silicon-based materials, alloy anode materials</p>
<b>Week 6-8</b>	<p>锂离子电池电解液: 定义、电解液中的溶剂、锂盐、添加剂</p> <p>Electrolytes of the lithium-ion battery: definition, the solvent in electrolyte, lithium salts, additives</p>
<b>Week 9-10</b>	<p>锂离子电池隔膜: 定义、常见的几类隔膜、性能参数、制备方法</p> <p>Separators of the lithium-ion battery: definition, common types of separators, performance and parameter, and preparation methods</p>
<b>Week 11</b>	<p>锂离子电池组装: 手套箱日常操作、极片制备工艺、电池组装</p> <p>Assembly of the lithium-ion battery: daily operation of the glove box, electrode preparation process, and the battery assembly</p>
<b>Week 12</b>	<p>锂离子电池测试技术: 结构形貌表征、电化学性能测试分析</p> <p>Test technology of the lithium-ion battery: structural characterization and electrochemical performance analysis</p>
<b>Week 13-14</b>	<p>下一代锂离子电池技术: 锂金属电池、锂硫电池、锂空气电池、固态电池</p> <p>Next-generation lithium-ion battery technology: lithium metal battery, lithium-sulfur battery, lithium-air battery, solid-state battery</p>
<b>Week 15</b>	<p>内容回顾梳理</p> <p>Content review</p>
<b>Week 16</b>	<p>答疑</p> <p>Q&amp;A</p>
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**13. 课程考核**  
**Course Assessment**

(①考核形式 Form of examination; ②.分数构成 grading policy; ③如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)

- 出勤 10%+平时作业 20%+期末考试 70%
- Attendance 10% + homework 20% + final exam 70%
- 期末开卷考试, 十三级等级制
- Final close-book exam, Letter Grading

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

1. 李泓. 锂电池基础科学, 北京: 化学工业出版社, 2021, ISBN: 978-7-122-39582-5
2. 郭炳琨, 徐微, 王先友, 肖立新. 锂离子电池, 长沙: 中南大学出版社, 2002, ISBN: 7-81061-563-7
3. 徐艳辉, 耿海龙, 李德成. 锂离子电池溶剂与溶质, 北京: 化学工业出版社, 2018, ISBN: 978-7-122-31521-2
4. 胡国荣, 杜柯, 彭忠东. 锂离子电池正极材料原理、性能与生产工艺, 北京: 化学工业出版社, 2017, ISBN: 978-7-122-29897-3
5. 徐国栋. 锂离子电池材料解析, 北京: 机械工业出版社, 2018, ISBN: 978-7-111-59101-6