# 课程大纲
# COURSE SYLLABUS

| | | |
|---|---|---|
| **1.** | **课程代码/名称<br>Course Code/Title** | **MSE，封装材料与技术 Packaging Materials and Technology** |
| **2.** | **课程性质<br>Compulsory/Elective** | **专业选修课 MSE Elective Course** |
| **3.** | **课程学分/学时<br>Course Credit/Hours** | **3 学分/48 学时 3 Credit/48 Hours** |
| **4.** | **授课语言<br>Teaching Language** | **英文 English** |
| **5.** | **授课教师<br>Instructor(s)** | **于严淏 Yu Yanhao** |
| **6.** | **是否面向本科生开放<br>Open to undergraduates or not** | **是 Yes** |
| **7.** | **先修要求<br>Pre-requisites** | **本科生：材料物理、材料化学；研究生：无<br>Undergraduate: Materials Physics, Materials Chemistry; Graduate: None** |

**8. 教学目标<br>Course Objectives**

封装材料与技术是芯片、LED、太阳能电池、储能电池等多种电子和能源系统稳定运行的关键。本课程讲授封装系统中的材料科学基础知识，内容包括封装简介、热力学与动力学基础、断裂力学基础、陶瓷封装材料、高分子封装材料、微电子封装、有机发光二极管封装、生物医疗器件封装、太阳能电池封装、储能电池封装、光电化学器件封装等。通过本课程的学习，学生将具备封装相关的材料、物理、化学、力学基础知识，了解目前封装主要材料设计和工艺路线，把握新兴电子和能源系统的封装需求和发展方向，为未来在封装领域研究和工作打好基础。

Packaging materials and technology ensures the operational stability of electronic and energy systems such as semiconductor chips, light emitting diode, solar cells, energy storage batteries. This course emphasizes the materials science fundamentals in packaging systems. The content includes basic concepts of packaging materials, thermodynamics and kinetics, fracture mechanics, ceramic packaging materials, polymer packaging materials, microelectronic packaging, OLED packaging, packaging for biomedical devices, solar cell packaging, battery packaging, photoelectrochemical device packaging, and et. al. After taking this course, the students will acquire the materials, physics, chemistry, mechanics knowledge about packaging. They will know the main material and technological designs in current packaging industry. They will get familiar with the packaging needs and trends in emerging electronic and energy systems and be prepared for the future research and work in the packaging area.

**9. 教学方法<br>Teaching Methods**

本课程着重强调学科交叉教学。比如，深入讨论不同物理概念之间的联系，或同一物理概念在不同领域的意义关联和差别。课程内容将根据学生的研究背景和兴趣动态调整，鼓励学生积极参与文献阅读、综述和汇报。课程将给予本科生特别的关注，保证他们可以跟上课程进度。

This course will emphasize interdisciplinary teaching. For example, discussing connections between different concepts, and the different roles of one concept in varied contexts. Lectures will be carefully chosen based on the research backgrounds and interests of students. Students will actively participate in literature reviews and topic presentations. Special cares will be given to undergraduates to ensure they can follow the class.

**10. 教学内容<br>Course Contents**

| | |
|---|---|
| **Section 1** | Introduction 封装简介 |
| **Section 2** | Thermodynamics and kinetics I 热力学与动力学基础 I |

| | | |
|---|---|---|
| | **Section 3** | Thermodynamics and kinetics II 热力学与动力学基础 II |
| | **Section 4** | Fracture mechanics I 断裂力学基础 I |
| | **Section 5** | Fracture mechanics II 断裂力学基础 II |
| | **Section 6** | Ceramic packaging 陶瓷封装材料 |
| | **Section 7** | Polymer packaging 高分子封装材料 |
| | **Section 8** | Midterm Exam 期中考试 |
| | **Section 9** | Microelectronic packaging 微电子封装 |
| | **Section 10** | OLED packaging 有机发光二极管封装 |
| | **Section 11** | Packaging for biomedical devices 生物医疗器件封装 |
| | **Section 12** | Solar cells packaging 太阳能电池封装 |
| | **Section 13** | Battery packaging 储能电池封装 |
| | **Section 14** | Photoelectrochemical device packaging 光电化学器件封装 |
| | **Section 15** | Final presentation 期末汇报 |

**11. 课程考核**
**Course Assessment**

课后作业/出勤 20%；期中考试 40%；期末汇报 40%
Homework/Attendance 20%; Midterm Exam 40%; Final Presentation 40%

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

Reading materials:
(1) Electronic Packaging and Interconnection Handbook, 4th Edition, Charles A. Harper, 2004, McGraw-Hill Education
(2) Materials for Advanced Packaging. Book, 2nd Edition, Daniel Lu and C.P. Wong, 2017, Springer
(3) 电子元器件可靠性设计，王蕴辉、孙再吉，2007，科学出版社