

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	材料物理 Physics of Materials				
2.	授课院系 Originating Department	材料科学与工程系 Department of Materials Science and Engineering				
3.	课程编号 Course Code	MSE328				
4.	课程学分 Credit Value	3				
5.	课程类别 Course Type	专业基础课 Major Foundational Courses				
6.	授课学期 Semester	春季 Spring				
7.	授课语言 Teaching Language	英语 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)	徐保民, 讲座教授, 材料科学与工程系 Dr. Baomin Xu, Chair Professor, Department of Materials Science and Engineering xubm@sustc.edu.cn 0755-88018980				
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)	60				
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	48				48

<p>12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements</p>	<p>MA102B 高等数学(下) A Calculus II A MSE001 材料科学与工程基础 Fundamentals of Materials Science and Engineering MSE203 晶体学 Crystallography</p>
<p>13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite</p>	<p>本课程是材料科学与工程专业基础课，是必修课；其他非材料专业的学生如果想学习有关材料物理和性能的基础知识，也可以选修本课程。 This course is a required fundamental major course for the students in MSE. Other non-MSE students also can register this course if they want to study the basic knowledge on physics and properties of materials.</p>
<p>14. 其它要求修读本课程的学系 Cross-listing Dept.</p>	<p>物理系，电子系，化学系 Depts. of Physics, Electrical Engineering, and Chemistry</p>

教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

本课程的设置是为了达到让学生获得材料科学与工程的基础理论，材料物理性能的基础知识，以及应用这些理论和知识设计材料和器件的基本技能的目的。材料物理是材料科学与工程专业的一门主要专业基础课。本课程教授了解材料性能所必需的物理基础理论，包括电子论和能带论，材料的电，磁，光，热等性能，这些性能的评价方法，及其与材料结构的关系；同时介绍基于这些性能的器件，应用，以及未来的发展前景。

The purpose of this course is to let students get the basic theory of materials science and engineering, the basic knowledge on the physical properties of materials, and the basic skill to design materials and devices based on the knowledge they have learned from this course. The Physics of Materials is an important fundamental course and is required for all the students with major in Materials Science and Engineering. This course covers the basic theory for understanding the properties of materials, including electron theory and band theory in solids. It also introduces the electrical, magnetic, optical, and thermal properties of materials, the characterization of these properties, and their relationship with the structures of materials. The state-of-art devices, applications, and futures based on materials properties will also be introduced.

16. **预达学习成果 Learning Outcomes**

通过本课程的学习，学生应掌握基本的材料物理理论，材料性能与原子和电子结构的关系，以及研究材料物理性能的基本方法；了解半导体材料和器件，光学材料和器件，磁学材料和器件的基本原理；能够用所学知识为特定的应用选择材料和设计器件结构。

After finishing this course students should be familiar with the basic theory of solid materials, the relationship between material properties and atomic and electronic structures, and the methodology to study the physical properties of materials. Students should also understand the basic principles of semiconductor materials and devices, optical materials and devices, and magnetic materials and devices, and should have the ability to select materials for particular applications.

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.)

共 24 讲，每讲 2 学时。

Totally 24 lectures, with each lecture of 2 credit hours.

Lecture # Topics

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|----|---|
| 1 | Introduction, Wave-Particle Duality
导论，波粒二象性 |
| 2 | Schrodinger Equation & its Application
薛定谔方程及应用 |
| 3 | Bonds
化学键 |
| 4 | Free electron theory
自由电子论 |
| 5 | Band theory of solids
固体能带论 |
| 6 | Electrical conduction
电子的导电性 |
| 7 | Semiconductors
半导体 |
| 8 | Semiconductor devices
半导体器件 |
| 9 | Dielectric and ferroelectric material
介电和铁电材料 |
| 10 | Superconductivity
超导电性 |
| 11 | Mid-term, 期中考试 |
| 12 | Foundation of magnetic materials
磁材料基础 |
| 13 | Magnetic phenomena and their interpretation
磁现象及其解释 |
| 14 | Applications of magnetic materials
磁材料的应用 (1) |
| 15 | Exam #2: Electrical and magnetic properties
测验 2: 材料的电性能和磁性能 |
| 16 | Optical phenomena and optical properties
光现象和光性能 |
| 17 | Theory of optical properties
光性能理论 |

18	Lasers 激光
19	Optoelectronics 光电子学
20	Other optical applications 其他光学应用
21	Fundamentals of thermal phenomena 热现象的基本理论
22	Phonon and thermal properties 声子和热性能
23	Thermal-electric coupling, applications 热电耦合, 应用
24	Review 总复习

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

Textbook: Rolf E. Hummel, Electronic Properties of Materials, 4 th Edition, 2011
Supplemental reference textbook: Laszlo Solymar et al., Electrical Properties of Materials, 9 th Edition, 2014 (earlier edition is acceptable)

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				
课堂表现 Class Performance				
小测验 Quiz		25		
课程项目 Projects				
平时作业 Assignments		15		
期中考试 Mid-Term Test		30		
期末考试 Final Exam		30		
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)

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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

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