

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	材料热力学 Thermodynamics of Materials				
2.	授课院系 Originating Department	材料科学与工程 Department of Materials Science and Engineering				
3.	课程编号 Course Code	MSE 311				
4.	课程学分 Credit Value	3				
5.	课程类别 Course Type	专业基础课 Subject-Foundation course				
6.	授课学期 Semester	秋季 Fall				
7.	授课语言 Teaching Language	英文 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)	刘玮书 副教授，材料科学与工程系 Dr. Weishu Liu, Department of Materials Science and Engineering liuws@sustc.edu.cn , 0755-88018955				
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	48	0	0	0	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 MA107B 线性代数 I B Linear Algebra I B MSE001 材料科学与工程基础 Fundamentals of Materials Science and Engineering</p>
<p>13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite</p>	
<p>14. 其它要求修读本课程的学系 Cross-listing Dept.</p>	<p>化学系, 物理系 Department of Chemistry, Department of Physics</p>

教学大纲及教学日历 SYLLABUS

15. 教学目标 **Course Objectives**

1. 介绍基础的热力学定律及其工程应用; Introduce the fundamental laws of thermodynamics and its engineering application
2. 让学生熟悉热力学经典方法和统计方法; Familiarize students with both classical and statistical approaches
3. 描述固体材料的热学行为, 包括比热、相变等; Describe the thermal behaviour of solid materials, including heat capacity, phase transitions etc.
4. 介绍溶体热力学; Introduce solution thermodynamics with respect to liquid and solid solutions
5. 运用热力学知识预测和解释相平衡; Use thermodynamics to predict and interpret phase equilibria
6. 运用热力学知识解释材料中的形核生长和缺陷等问题。Use thermodynamics to explain and understand various growth phenomena and material defects.

16. 预达学习成果 **Learning Outcomes**

学生通过对本门课程将掌握热力学基本定律, 并能解决一些简单的实际工程问题, 能够区分经典热力学方法和统计热力学方法, 能够运用热力学知识解释固态材料的热学行为比如相变, 能够运用溶体热力学知识解释液相溶体和固相溶体的行为, 运用热力学知识解释材料中的形核生长和缺陷等问题。

A student who has completed this course will be able to articulate the fundamental laws of thermodynamics and use them in basic problem solving, be able to discriminate between classical and statistical approaches, be able to use thermodynamics to describe the thermal behaviour of solid materials, including phase transitions, be able to use thermodynamics to describe transformations in materials, be capable of applying solution thermodynamics for describing liquid and solid solution behaviour, and to use thermodynamics to explain various growth phenomena and material defects.

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.)

Lecture #	Topics	1 topic=2 credit hours
1	Introduction (课程简介)	
2	1 st law of thermodynamics and Enthalpy (热力学第一定律和焓)	
3	2 nd law of thermodynamics and Entropy (热力学第二定律和熵)	
4	Carnot efficiency and Exergy (卡诺效率与可用能)	
5	Fundament of Engineering thermodynamics (工程热力学基础)	
6	Engineering thermodynamics - heat engine (工程热力学-热机)	
7	Engineering thermodynamics - refrigerator, thermoelectric devices (工程热力学-制冷机、热电器件)	
8	Statistical thermodynamic interpret of Entropy (熵的统计热力学解释)	
9	Gibbs Free Energy (自由能)	
10	General thermodynamics relation (热力学关系)	
11	Statistical thermodynamics application I, heat capacity (统计热力学应用-比热)	
12	Midterm (期中考试)	
13	Phase diagram I, One component (一元相图)	
14	The behaviour of gas (气相溶体的行为)	
15	The behaviour of solutions (液相和固相溶体的行为)	
16	Phase diagram II, Two component (二元相图-I)	
17	Phase diagram III, Two component (二元相图-II)	
18	Phase diagram IV, Multi component (多元相图)	
19	Phase diagram, Application (相图应用)	
20	Effect of external force I, Nucleation, Growth, Phase change (外场对相平衡的影响 I-形核、生长、相变)	
21	Effect of external force II, Electrochemistry (外场对相平衡的影响 II-电化学)	
22	Defects, interface, and surface (缺陷、界面、表面)	
23	Review (复习)	
24	Final exam (期末考试)	

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

Textbook: Introduction of the thermodynamics, 5th edition, David R. Gaskell, Talaor & Fracis, Thermodynamics: An engineering approach, 8th edition, Yunus A. Cengel, Michael A. Boles, Mc Graw Hill

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	15		
课程项目 Projects			
平时作业 Assignments	25		
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)			

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

