

上海交通大学研究生课程开设申请表

New Graduate Course Application Form, SJTU

课程基本信息 Basic Information				
*课程名称 Course Name	(中文 Chinese) 高等材料热力学			
	(英文 English) Advanced Thermodynamics of Materials			
*学分 Credits	3	*学时 Teaching Hours	48	(1 学分 ≥ 16 课时)
*开课学期 Semester	秋季 Fall	*时否跨学期 Cross-semester?	否	跨 Spanning over 个 学期 Semesters.
*课程性质 Course Category	专业课 Major Course	*课程分类 Course Type	全日制 Full-time	
*授课语言 Instruction Language	中文 Chinese			
*成绩类型 Grade	等级制 Letter Grade			
*开课院系 School	(050) 材料科学与工程学院 School of Materials Science & Engineering			
所属学科 Subject	0805 材料科学与工程			
负责教师 Person in charge	姓名 Name	工号 ID	单位 School	联系方式 E-mail
	金学军			jin@sjtu.edu.cn
课程扩展信息 Extended Information				
*课程简介 (中文) Course Description	<p>以热力学和统计热力学的原理和方法研究材料问题，称谓材料热力学。它与动力学、晶体学以及固体物理和固体化学组成材料科学的基础。材料工程包括材料的设计、制造、成型和检验，它是应用材料科学的原理进行材料设计和加工的综合学科，与材料科学和工程已成为一个整体。</p> <p>热力学在这个领域的应用，对发展材料的品种、提高材料的质量，日益显示其积极的作用。应用材料热力学原理可以阐明和预测相图、相变以及材料的其他物理现象。材料热力学既掌握热力学的基本知识，又能将这些原理和方法结合材料实践加以应用。重点掌握热力学的基本概念、原理和方法，理解相图的构成规则和诠释相图。</p> <p>高等材料热力学是在学生已经掌握本科水平的材料热力学或者材料物理化学的基础上，进一步梳理课程内容，在教学内容和教学深度上做到本硕博良好衔接。</p>			

学习内容上要求掌握更高等水平，掌握相变、相图、界面、统计、不可逆过程等热力学原理。熟悉并初步掌握热力学基本原理在材料设计和加工中的应用，学以致用。

Thermodynamics and statistical thermodynamics are used to study the material problem and the thermodynamics of appellation material. It is based on dynamics, crystallography, solid state physics and solid chemistry. Materials engineering includes materials design, manufacturing, molding and inspection. It is a comprehensive discipline that applies material science principles to design and process materials and combined with material science and engineering as a complete part.

The application of thermodynamics in this field plays an active role in developing varieties of materials and improving the quality of materials. The application of material thermodynamics principle can clarify and predict phase diagrams, phase transitions and other physical phenomena of materials. Material thermodynamics not only grasps the basic knowledge of thermodynamics, but also applies these principles and methods to material practice. We should grasp the basic concepts, principles and methods of thermodynamics, understand the rules of phase diagram and interpret phase diagrams.

The advanced thermodynamics is based on the material thermodynamics and physical chemistry courses which have be mastered in the undergraduate level. This course requires combs the course content, and makes a good connection between the teaching content and teaching depth. The students need to master higher level in learning content, grasp the thermodynamics principles of phase transformation, phase diagram, interface, statistics, irreversible process and so on. Be familiar with and grasp the application of the basic principles of thermodynamics in material design and processing, and apply it to practice.

*课程简介 (English) Course Description				
	教学内容 Content	授课学时 Hours	教学方式 Format	授课教师 Instructor
*教学大纲 (中文) Syllabus	导论：材料热力学及其应用	2	课堂教学	金学军
	热力学基础（复习及研讨）	6	课堂教学/课后自习	金学军
	自由能计算、溶体模型与相图热力学	8	课堂教学	金学军
	相图计算原理与实践	4	机房实践	李伟
	相变热力学	8	课堂教学	金学军
	界面热力学	6	课堂教学	李伟
	统计热力学概述	6	课堂教学	李伟
	不可逆过程热力学	2	课堂教学	李伟
	小组研讨（热力学及其应用解析）	4	互动	金学军/李伟
	考试	2	随堂	金学军/李伟

*教学大纲 (English) Syllabus				
	教学内容 Content	授课学时 Hours	教学方式 Format	授课教师 Instructor

	Introduction	2	Lecture	X Jin & W Li
	Review and fundamentals of thermodynamics	6	Lecture/exercises	X Jin & W Li
	Calculations of free energy, solutions and thermodynamics of phase diagram	8	Lecture	X Jin & W Li
	Practice of TC software	4	Computational lab	X Jin & W Li
	Thermodynamics of phase transformation	8	Lecture	X Jin & W Li
	Thermodynamics of interfaces	6	Lecture	X Jin & W Li
	Statistics of thermodynamics	6	Lecture	X Jin & W Li
	Thermodynamics of irreversible processes	2	Lecture	X Jin & W Li
	Group assignments	4	Presentation	X Jin & W Li
	Final exam	2	At class	X Jin & W Li
*课程要求 (中文) Requirements	平时成绩 (20%) 考试 (30%) 课程设计 (50%)			
*课程要求 (English) Requirements	Regular grade (20%) Exam grade (30%) Curriculum project (50%)			
课程资源 (中文) Resources	David V. Ragone, Thermodynamics of Materials, John Wiley & Sons, 1995 郝士明译, Nishizawa T 著, 《微观组织热力学》, 化学工业出版社, 2006 徐祖耀, 材料热力学, 高等教育出版社, 2010			
课程资源 (English) Resources	David V. Ragone, Thermodynamics of Materials, John Wiley & Sons, 1995 Nishizawa T, Thermodynamics of microstructure, translated by Hao Shiming, Chemical industry press, 2006 Xu Zuyao, material thermodynamics, higher education press, 2010			
备注 Note				