

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) 固态相变与组织调控			
	(英文 English) Fundamentals of solid state phase transformation and microstructures regulation			
*学分 Credits	2	*学时 Teaching Hours	32 (1 学分≥16 课时)	
*开课学期 Semester	秋季学期 Fall	*是否跨学期 Cross-semester?	否 No	跨 Spanning over 一个学期 Semesters (含夏季学期)。
*课程性质 Course Category	专业课 Specialized Course	*课程分类 Course Type	全日制课程 For full-time students	
*授课语言 Instruction Language	中文 Chinese	主要授课方式 Teaching Method	课堂教学 In class teaching	
*成绩类型 Grade	等第制 Letter grading	主要考核方式 Exam Method	笔试 Written Exam	
*开课院系 School	材料科学与工程学院 School of Materials Science and Engineering			
所属学科 Subject	材料科学与工程 Materials Science and Engineering			
负责教师 Person in charge	姓名 Name	工号 ID	单位 School	联系方式 E-mail
	李伟		材料科学与工程学院	weilee@sjtu.edu.cn
课程扩展信息 Extended Information				
*课程简介 (中文) Course Description	<p>(分段概述课程定位、教学目标、主要内容、先修课程等；不少于 200 字。)</p> <p>利用马氏体等固态相变过程中的热力学、动力学、晶体学知识，理解钢、记忆合金等先进金属材料在新型制造工艺体系下的组织演变规律和机制。通过课程学习，使学生了解先进金属材料微观组织设计与调控的前沿知识，获得识别复杂显微组织的能力，掌握通过固态相变调控多相、多尺度、多层次显微组织的方法，为金属材料的失效行为分析和力学性能调控奠定基础。目前，正值金属材料发展的高速时期，金属材料设计的新思路、新理念不断涌现，需要新课程帮助研究生高效的、系统的接触金属材料组织设计、调控的前沿知识，为研究生奠定坚实的科研基础。</p> <p>课程涵盖“淬火配分 QP/QPT 钢”，“节镍型低温钢”和“NiTi 记忆合金微丝超弹性与弹热效应”等多个实用案例，从研发固态相变与组织调控原理阐述如何实现材料创新设计和研发。</p>			
*课程简介 (English) Course Description	<p>(须与中文一致，翻译请力求信达雅。)</p> <p>Based on the fundamentals of thermodynamics, kinetics and crystallography in the process of martensite transformation, we can understand the microstructure evolution rule and mechanism of steels, shape memory alloys and other advanced metal materials in the new manufacturing process system. Through the course study, students can understand the frontier knowledge of microstructure design and control of advanced metal materials, acquire the ability to identify complex microstructure, master the method of controlling multi-phase, multi-scale and multi-level microstructures through solid phase transformation, and lay the foundation for failure behavior analysis and mechanical property control of metal materials. At present, with the rapid development of metal materials, new ideas and concepts of metal material design are emerging. New courses are needed to help postgraduates to contact the cutting-edge knowledge of metal material organization design and control efficiently and systematically, so as to lay a solid scientific research foundation for postgraduates. The course covers a number of practical cases, such as "quenching and partitioning QP / QPT steel", "nickel saving low temperature steel" and "NiTi SMA micro wire with super elasticity and elastic thermal effect", and expounds how to realize the innovative design and research of materials from the research and</p>			

	development of solid-state phase transformation and microstructures regulations.			
*教学大纲 (中文) Syllabus	(建议列表形式, 各列内容: 章节、主要内容、课时数、教学方式)			
	章节	主要内容	课时数	教学方式
	导论	固态相变理论和应用简介	2	课堂讲授
	相变热力学	热力学和相图	2	课堂讲授
		扩散和界面	2	课堂讲授
	相变动力学	扩散型相变动力学	2	课堂讲授
		无扩散型相变动力学	2	课堂讲授
	相变晶体学	马氏体相变晶体学模型	2	课堂讲授
		马氏体形核和组织特征	2	课堂讲授
	高强钢组织调控	超细铁素体钢	2	课堂讲授
		超级纳米贝氏体钢	2	课堂讲授
		马氏体高强钢的回火	2	课堂讲授
		Q&P 和 Q-P-T 钢	2	课堂讲授
	高性能金属材料组织调控	节镍型低温钢	2	课堂讲授
		高性能合金介绍包括 SMA、高熵等	2	课堂讲授
		各类高性能合金性能及原理介绍	2	课堂讲授
期末考试	经典案例分析	2	课堂讲授	
	考核	2	课堂考试	
*教学大纲 (English) Syllabus	(须与中文一致, 翻译请力求信达雅。)			
	Chapter	Content	hour	Format
	Introduction	Brief introduction of solid-state phase transformation and application	2	Classroom Lecture
	thermodynamics	Thermodynamics and interfaces	2	Classroom Lecture
		Diffusion and interface	2	Classroom Lecture
	Phase transition kinetics	Diffusional trnsition	2	Classroom Lecture
		Diffusionless trnsition	2	Classroom Lecture
	Crystallography of phase transformation	Crystallographic model of martensitic transformation	2	Classroom Lecture
		Nucleation and microstructure of martensite	2	Classroom Lecture
	Microstructure control of high strength steel	Ultrafine ferritic steel	2	Classroom Lecture
		Super nano bainitic steel	2	Classroom Lecture
		Tempering of	2	Classroom

		martensitic high strength steel		Lecture	
		Q&P and Q-P-T steel	2	Classroom Lecture	
		Nickel saving low temperature steel	2	Classroom Lecture	
	Microstructure control and application of high performance metal functional materials		The introduction of high performance alloys includes SMA, high entropy and so on	2	Classroom Lecture
			Introduction of properties and principles of various high performance alloys	2	Classroom Lecture
			Case Study	2	Classroom Lecture
		final exam	final exam	2	exam
*课程要求 (中文) Requirements	<p>(课程考核方式、考核标准等; 不少于 50 字)</p> <p>考核方式为课堂与课后作业的平时成绩、期末随堂考试和通过学习本课程以后结合学生研究方向的一份课程设计报告。</p> <p>考核标准: 平时作业 (30%) + 期末考试 (40%) + 课程设计 (30%)</p>				
*课程要求 (English) Requirements	<p>(须与中文一致, 翻译请力求信达雅。)</p> <p>The assessment method is to combine the classroom and after-school homework, final examination and a course design report corresponding to students' research after learning this course. The assessment method is to combine the usual results of classroom and after-school homework, final examination and a course design report combined with students' research direction after learning this course.</p> <p>Assessment standard : Assignment (30%) + final exam (40%) + project (30%)</p>				
课程资源 (中文) Resources	<p>(教材、教参、网站资料等。)</p> <p>《金属与合金中的相变》, David A. Porter, Kenneth E. Easterling and Mohamed Y. Sherif 2008, CRC 出版社, 第三版</p>				
课程资源 (English) Resources	<p>(须与中文一致, 请力求信达雅。)</p> <p>《Phase Transformation in Metals and Alloys》, David A. Porter, Kenneth E. Easterling and Mohamed Y. Sherif, CRC press, 2008, Third Edition</p>				
备注 Note					