

# 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				
<b>*课程名称</b> Course Name	(中文 Chinese) 新型半导体材料及其应用			
	(英文 English) Novel Semiconductor Materials and Their Applications			
<b>*学分</b> Credits	2	<b>*学时</b> Teaching Hours	32 (1 学分≥16 课时)	
<b>*开课学期</b> Semester	春季学期 Spring	<b>*是否跨学期</b> Cross-semester?	否 No	跨 Spanning over 个学期 Semesters (含夏季学期)。
<b>*课程性质</b> Course Category	专业课 Specialized Course	<b>*课程分类</b> Course Type	全日制课程 For full-time students	
<b>*授课语言</b> Instruction Language	中文 Chinese	<b>主要授课方式</b> Teaching Method	课堂教学 In class teaching	
<b>*成绩类型</b> Grade	等第制 Letter grading	<b>主要考核方式</b> Exam Method	其它 Other	
<b>*开课院系</b> School	材料科学与工程学院			
<b>所属学科</b> Subject				
<b>负责教师</b> Person in charge	<b>姓名 Name</b>	<b>工号 ID</b>	<b>单位 School</b>	<b>联系方式 E-mail</b>
	赵琨鹏	11912	材料科学与工程学院	zkp.1989@sjtu.edu.cn
课程扩展信息 Extended Information				
<b>*课程简介</b> (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>半导体科学在现代科学技术中占有极为重要的地位，广泛应用于国民经济的各个领域。半导体材料是半导体科学发展的基础，在功能材料、材料科学、电子信息等学科或专业中发挥中不可替代的作用。本课程将重点介绍超禁带半导体、纳米半导体、无机塑性半导体等新型半导体材料的基本性质、特点与潜在应用，为下一代半导体材料技术人才的培养储备良好的基础知识，让学生了解新型半导体材料的重要性、未来发展的技术难点与关键点，从而激发更多人投身于半导体材料事业。此外，本课程可以培养学生严谨的科学态度和思维方法，吸纳更多优秀的研究生参与到信息材料、能源材料等相关科研工作中，培养一大批半导体材料方面的专业人才。学习本课程无需先修其他课程。</p>			
<b>*课程简介</b> (English) Course Description	<p>(须与中文一致，翻译请力求信达雅。)</p> <p>Semiconductor materials are the foundation for the development of semiconductor science, and play an irreplaceable role in functional materials, materials science, electronic information and other fields. This course will focus on introducing the basic properties, characteristics and potential applications of new semiconductor materials such as super bandgap semiconductors, nanoscale semiconductors, and inorganic flexible semiconductors, providing a solid foundation of knowledge for the training of next-generation semiconductor material technology professionals, enabling students to understand the importance of new semiconductor materials, future technical difficulties and key points for development, and inspiring more people to engage in the semiconductor materials. In addition, this course can cultivate students' rigorous scientific attitude and thinking methods, attracting more outstanding graduate students to participate in related scientific research work, such as information materials, energy materials, and cultivating a large number of professionals in semiconductor physics. No prerequisite courses are required before studying this course.</p>			

(建议列表形式, 各列内容: 章节、主要内容、课时数、教学方式)				
*教学大纲 (中文) Syllabus	章节	主要内容	课时数	教学方式
	1、半导体材料概述	(1) 发展简史 (2) 半导体材料的分类 (3) 基本性质 (4) 应用发展趋势	4	课堂讲授
	2、第三代半导体: 宽禁带半导体材料	(1) 碳化硅 (SiC) (2) 氮化镓 (GaN) (3) 氧化锌 (ZnO)	6	课堂讲授
	2、第四代半导体: 超禁带半导体材料	(1) 潜力无限的氧化镓 ( $Ga_2O_3$ ) (2) 超宽带隙的氮化铝 (AlN) (3) 超窄带隙的铋化物半导体	6	课堂讲授
	4、半导体领域的新星: 无机塑性半导体	(1) 无机塑性半导体的结构特征 (2) 解理与滑移 (3) 电-热-力耦合性质 (4) 应用	6	课堂讲授
	5、其它新型半导体材料	(1) 非晶态和无序半导体 (2) 纳米半导体材料 (3) 有机半导体材料	6	课堂讲授
	6、半导体材料的制备与表征	(1) 制备方法 (邀请报告) (2) 半导体薄膜生长方法 (3) 结构表征 (4) 电热输运性能表征	4	课堂讲授
*教学大纲 (English) Syllabus	(须与中文一致, 翻译请力求信达雅。)			
	Chapter	Content	Teaching Hours	Teaching Method
	1. Introduction of semiconductor materials	(1) Development history (2) Classification of semiconductor materials (3) Basic properties (4) Latest progress and development trends.	4	In class teaching
	2. Third generation semiconductor: wide bandgap semiconductor materials	(1) Silicon carbide (SiC) (2) Gallium nitride (GaN) (3) Zinc oxide (ZnO)	6	In class teaching
	3. Fourth generation semiconductor: Super band-gap semiconductor materials	(1) Unlimited potential oxide gallium (2) Ultra-wide bandgap aluminum nitride. (3) Ultra-narrow bandgap antimony semiconductor	6	In class teaching
	4. Inorganic plastic semiconductor materials	(1) Structural characteristics of inorganic plastic semiconductors (2) Cleavage and slipping (3) Electrical-thermal-mechanical coupling properties (4) Applications.	6	In class teaching
	5. Other novel semiconductor materials	(1) Noncrystalline semiconductor materials (2) Nano semiconductor materials (3) Organic semiconductor materials	6	In class teaching
6. Preparation and characterization of semiconductor materials	(1) Preparation method (invited talk) (2) Structural characterization (3) Characterization of electrical and thermal transport properties.	4	In class teaching	

<p>*课程要求 (中文) Requirements</p>	<p>(课程考核方式、考核标准等; 不少于 50 字) (1) 课堂表现 (认真听讲、积极提问和回答问题、与老师互动) 20 分 (2) 平时作业 (四次作业) 20 分 (3) 期末报告 (调研半导体材料在某领域内的应用, 15 分钟的口头报告) 60 分</p>
<p>*课程要求 (English) Requirements</p>	<p>(须与中文一致, 翻译请力求信达雅。) (1) Classroom performance, 20%. (2) Regular homework, 20%. (3) Final oral report, 60%.</p>
<p>*课程资源 (中文) Resources</p>	<p>(教材、教参、网站资料等。) 半导体材料, 王如志、刘维、刘立英 半导体材料, 贺格平, 魏剑, 金丹</p>
<p>*课程资源 (English) Resources</p>	<p>(须与中文一致, 请力求信达雅。) <u>Semiconductor materials, Zhiru Wang, Wei Liu, Liying Liu</u> <u>Semiconductor materials, Geping He, Jian Wei, Dan Jin</u></p>