

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	现代材料表面工程与技术 Modern Materials Surface Engineering and Technologies			
*学分 Credits	2	*总学时 Teaching Hours	32	
*开课季节 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 Nature	专业课 Specialized Course	*课程分类 Course Type	全日制课程 For full-time students	
*课程类别 Course Category	专业选修课 Specialized Elective Course	*课程层次 Course Level	硕博共用 For All Graduates	
*授课语言 Instruction Language	英文 English	*主要上课方式 Teaching Method	课堂教学 In class teaching	
*成绩记录方式 Grade	等级制 Letter grading	*主要考试类型 Exam Method	论文 Essay	
*开课单位 School	材料科学与工程学院			
所属一级学科 Subject	材料加工工程			
负责教师 Person in charge	姓名 Name	工号 ID	单位 School	联系方式 E-mail
	毛博		材料科学与工程学院	bmao@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>表面工程是通过表面涂覆、表面改性或多种表面复合处理，改变固体金属或者非金属表面的形态、化学成分、组织结构，以获得表面所需性能的系统工程。表面工程技术在我国装备维修以及先进制造领域获得广泛应用，每年产生了上千亿的经济效益。现代激光、超声、人工智能等技术的发展催生了新型的材料表面处理技术，极大地拓展了其应用范围。</p> <p>本课程为上海交通大学“双一流”校企合作课程，以交大的硕士和博士研究生为授课对象，全面介绍现代表面工程的方法和实践，包括但不限于激光表面处理、超声表面强化、超音速热喷涂、高能束表面热处理等技术。课程将介绍它们的技术原理、特点、以及国内外研究热点、应用现状和技术发展趋势。与此同时，课程将邀请企业相关领域的首席专家进行表面工程实际案例的课堂授课。课程包含实践参观模块，让学生能够在高新技术公司实地了解现代表面工程技术的应用和价值。</p> <p>本课程是一门以介绍先进材料表面工程为主要内容的多学科交叉的综合课程，需有本科阶段的材料科学基础、材料加工原理等课程作为预修课程，适合材料科学与工程专业的硕士、博士研究生作为专业选修课学习。</p>			
	*课程简介 (English) Course Description	<p>Surface engineering is a subject focus on changing the morphology, chemical composition, and microstructure of solid metallic or non-metallic materials by a variety of surface processing techniques, aiming at realizing the optimized and desired surface properties. Surface engineering technologies have been extensively utilized in the facticity maintenance and advanced manufacturing industry of China, bringing about billions of economic profits. The cutting-edge technological innovations, such as laser, ultrasound, and artificial intelligence, has cultivated novel material surface processing techniques and greatly expand their applications.</p> <p>This course belongs to the Double-First Class Course Project of SJTU collaborated with</p>		

	<p>prestigious enterprises. It is designed for the graduate students in the School of Materials Science and Engineering to introduce the basic principles and practices of modern surface processing technologies, including laser surface processing, ultrasonic surface strengthening, supersonic hot spraying, high energy beam surface treatment, etc. The mechanism, characteristics, applications, challenges, research focus, and future research directions of these technologies will be discussed and presented. Moreover, senior experts from related enterprises will be invited to give lectures to demonstrate practical cases of surface engineering. The course also includes onsite factory tour part to enable the students have the chance to visit the real exercise of surface processing techniques and realize their values and applications.</p> <p>The course is a multidisciplinary comprehensive course, mainly introducing the surface engineering technologies. The prerequisite courses for the current course include fundamentals of material science, the principle of material processing, etc. It is suitable for the postgraduate students and doctoral candidate in material science and engineering.</p>				
<p>*教学大纲 (中文) Syllabus</p>	(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	章节是否有课程思政内容。如有, 请详述
	1	现代材料表面工程与技术概述	2	课堂教学	无
	2	材料表面性能	4	课堂教学	无
	3	材料表面熔覆技术	6	课堂教学+企业参观	无
	4	材料表面涂装和粘涂技术	6	课堂教学+企业参观	无
	5	材料表面沉积技术	4	课堂教学+企业参观	无
	6	材料表面塑性加工技术	4	课堂教学+企业参观	无
	7	材料表面工程技术设计与自动化	2	课堂教学	无
	8	材料表面工程未来发展趋势	2	课堂教学	无
9	材料表面工程前沿技术	2	课堂教学	无	
<p>*教学大纲 (English) Syllabus</p>	(须与中文一致, 翻译请力求信达雅。)				
	Chapter	Main Contents	Hours	Teaching Style	Whether there is ideological and political content
	1	Introduction to the modern materials surface engineering and technologies	2	Class lecture	No
	2	Surface properties of materials	4	Class lecture	No
	3	Materials surface engineering based on remelting and cladding technologies	6	Class lecture and onsite factory tour	No
	4	Materials surface engineering based on painting and coating technologies	6	Class lecture and onsite factory tour	No
	5	Materials surface engineering based on painting and coating technologies	4	Class lecture and onsite factory tour	No
	6	Materials surface engineering based on deposition technologies	4	Class lecture and onsite factory tour	No
	7	Materials surface engineering based on plastic deformation	2	Class lecture	No
	8	Design and automation principles of materials surface engineering	2	Class lecture	No
9	Future technologies of materials surface engineering	2	Class lecture	No	

<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)</p> <p>通过本课程的学习, 使学生对材料表面工程技术的发展有一个新的认识高度, 全面掌握表面工程与技术的新理论、新技术、新应用, 能够利用现代表面工程的新方法来解决工程实践过程中遇到的实际问题。</p> <p>本课程通过参观实践报告以及学期论文进行考核, 学生将依据自己课堂和企业实践所学的内容, 结合文献阅读调研, 撰写参观实践报告。与此同时, 学生将在学期论文中挑选一个现代表面工程的现实案例, 进行文献调研综述, 提出研究目标、研究方案, 撰写学期论文, 展示出其利用表面工程的方法解决工程问题的能力。</p>
<p>*课程要求 (English) Requirements</p>	<p>(须与中文一致, 翻译请力求信达雅。)</p> <p>By enrolling in this course, the students may understand the latest development of modern materials surface engineering. The students need to grasp the cutting-edge theories, technologies, applications of surface engineering, able to resolve the industry and practical issues they may encounter related to the surface processing.</p> <p>The grade of this course will be evaluated based on the practice report and term paper. The students are required to submit the on-site factory tour report based on what they have learned on class and during the tour. Moreover, the students are required to write a term paper based on the practical surface engineering issues. The term paper should include literature review, research targets, research plan, ect., to demonstrate their capabilities to solve the engineering problems by surface processing technologies.</p>
<p>*课程资源 (中文) Resources</p>	<p>参考教科书:</p> <p>(1) P. A. Dearnley, Introduction to Surface Engineering, Cambridge University Press, 2017.01</p> <p>(2) 王宇鑫等, 材料表面工程技术, 中南大学出版社, 2022.12</p> <p>(3) 李慕勤等, 材料表面工程技术, 化学工业出版社, 2010.08</p> <p>(4) 田保红等, 材料表面与界面工程技术, 化学工业出版社, 2021.07</p> <p>(5) Tadeusz Burakowski, Surface Engineering of Metals: Principles, Equipment, Technologies (Materials Science & Technology), CRC Press, 1998.12</p> <p>(6) Yves Pauleau, Materials Surface Processing by Directed Energy Techniques, Elsevier Science, 2006.04</p>
<p>*课程资源 (English) Resources</p>	<p>Book references:</p> <p>(1) P. A. Dearnley, Introduction to Surface Engineering, Cambridge University Press, 2017.01</p> <p>(2) Xinyu Wang et al. Materials Surface Processing Technology, Central South University Press, 2022.12 (In Chinese)</p> <p>(3) Muqing Li et al. Materials Surface Processing Technology, Chemical Engineering Press, 2010.8 (In Chinese)</p> <p>(4) Baohong Tian et al. Materials Surface and Interface Technology, Chemical Engineering Press, 2021.7 (In Chinese)</p> <p>(5) Tadeusz Burakowski, Surface Engineering of Metals: Principles, Equipment, Technologies (Materials Science & Technology), CRC Press, 1998.12</p> <p>(6) Yves Pauleau, Materials Surface Processing by Directed Energy Techniques, Elsevier Science, 2006.04</p>