上海交通大学研究生课程开设申请表

New Graduate Course Application Form, SJTU

<table>
<tr><th colspan="6">课程基本信息 Basic Information</th></tr>
<tr><td rowspan="2">*课程名称
Course Name</td><td colspan="5">（中文 Chinese） 无机固体材料化学</td></tr>
<tr><td colspan="5">（英文 English） Solid State Chemistry of Inorganic Materials</td></tr>
<tr><td>*学分
Credits</td><td>2</td><td>*学时
Teaching Hours</td><td colspan="3">32 （1 学分≥16 课时）</td></tr>
<tr><td>*开课学期
Semester</td><td>春季
Spring</td><td>*时否跨学期
Cross-semester?</td><td>否</td><td colspan="2">跨 Spanning over 个 学期 Semesters。</td></tr>
<tr><td>*课程性质
Course Category</td><td>专业课
Major Course</td><td>*课程分类
Course Type</td><td colspan="3">全日制
Full-time</td></tr>
<tr><td>*授课语言
Instruction Language</td><td colspan="5">中文 Chinese</td></tr>
<tr><td>*成绩类型
Grade</td><td colspan="5">等级制 Letter Grade</td></tr>
<tr><td>*开课院系
School</td><td colspan="5">(050)材料科学与工程学院
School of Materials Science & Engineering</td></tr>
<tr><td>所属学科
Subject</td><td colspan="5"></td></tr>
<tr><td rowspan="3">负责教师
Person in charge</td><td>姓名 Name</td><td>工号 ID</td><td colspan="2">单位 School</td><td>联系方式 E-mail</td></tr>
<tr><td>黄富强</td><td></td><td colspan="2"></td><td>huangfq@sjtu.edu.cn</td></tr>
<tr><td>林天全</td><td></td><td colspan="2">(050)材料科学与工程学院</td><td>tqlin@sjtu.edu.cn</td></tr>
<tr><th colspan="6">课程扩展信息 Extended Information</th></tr>
<tr><td>*课程简介
(中文)
Course Description</td><td colspan="5">材料的发展是人类社会进化的里程碑，材料科学是一门集材料、化学、物理等多学科于一体的综合学科。以发现新结构、新物质、新材料为目标的固体化学，旨在原子和分子水平上指导新材料设计合成，是众多高性能材料的基础和先导。上海交通大学材料科学与工程学院致力于培养具备材料科学与工程专业基础知识的前瞻人才，为了进一步强化学院兼具基础教育与创新精神的培养理念，结合任课老师在固体化学、固体物理、材料科学方面的综合知识背景与研究经历，将科研成果转化为研究生育人优势，开设 “无机固体材料化学”课程。

本课程涵盖无机固体材料化学基础理论与前沿发展，从原子、分子、晶体结构等多尺度讲述固体材料结构设计理论、构效关系，进一步拓展至材料发展前沿动态与应用实例。</td></tr>
</table>

	将基础理论与学科前沿发展相结合，使学生掌握无机固体材料的基础理论、理化特性、制备表征方法，并了解无机固体材料领域前沿研究成果与发展趋势，拓展专业视野。以厚基础、强应用、求创新为授课理念，培养兼具扎实专业基础与开拓创新思维的复合人才。
*课程简介 （English） Course Description	The development of materials marks significant milestones in the evolution of human society. Materials science is an interdisciplinary field that integrates materials, chemistry, physics, and more. Solid-state chemistry, which focuses on discovering new structures, substances, and materials, aims to guide the design and synthesis of new materials at the atomic and molecular levels. It serves as the foundation and precursor for numerous high-performance materials. The School of Materials Science and Engineering at Shanghai Jiao Tong University is dedicated to cultivating forward-thinking talents with a solid foundation in materials science and engineering. To further strengthen the school's philosophy of combining fundamental education with innovative spirit, this course, "Chemistry of Inorganic Solid Materials," leverages the instructors' comprehensive knowledge and research experience in solid-state chemistry, solid-state physics, and materials science, transforming research achievements into advantages for graduate education. This course covers the fundamental theories and cutting-edge developments in the chemistry of inorganic solid materials. It discusses the design theories and structure-property relationships of solid materials across multiple scales, including atomic, molecular, and crystal structures. The course extends to the latest advancements and practical applications in material development. By integrating fundamental theories with the latest developments in the field, students will gain a comprehensive understanding of the basic theories, physicochemical properties, and preparation and characterization methods of inorganic solid materials. They will also become familiar with the forefront research outcomes and trends in the field, broadening their professional horizons. The course aims to cultivate well-rounded talents with a solid professional foundation and innovative thinking, adhering to the principles of strong foundation, practical application, and pursuit of innovation.
*教学大纲 (中文) Syllabus	**一、无机固体化学概论（2 学时）** 1.1 无机固体化学简介 1.2 无机固体化学发展前沿领域 **二、晶体结构与物性基础（4 学时）** 2.1 化学键概述 2.2 电子结构 2.3 晶体结构 2.4 构效关系 **三、无机固体材料制备合成方法（6 学时）** 3.1 无机化学反应基本原理与经典合成方法 3.2 拓扑合成方法

	3.3 极端条件下合成方法 **四、无机固体材料的化学调控与功能强化（10 学时）** 4.1 双结构功能区的概念与堆积因子模型 4.2 压力调控结构与功能强化 4.3 缺陷调控结构与功能强化 4.4 外场调控结构与功能强化 **五、无机固体新材料的结构设计与应用（10 学时）** 5.1 多功能复杂化合物的结构设计基本原理 5.2 量子材料的结构设计 5.3 超导材料的结构设计 5.4 电能源材料的结构设计 5.5 载能分子的化学键构建
*教学大纲 (English) Syllabus	1. **Introduction to Inorganic Solid Chemistry (2 hours)** 1.1 Overview of Inorganic Solid Chemistry 1.2 Frontier Fields in Inorganic Solid Chemistry **2. Fundamentals of Crystal Structure and Properties (4 hours)** 2.1 Overview of Chemical Bonds 2.2 Electronic Structure 2.3 Crystal Structure 2.4 Structure-Property Relationships **3. Synthesis Methods of Inorganic Solid Materials (6 hours)** 3.1 Basic Principles of Inorganic Chemical Reactions and Classical Synthesis Methods 3.2 Topological Synthesis Methods 3.3 Synthesis Methods under Extreme Conditions **4. Chemical Regulation and Functional Enhancement of Inorganic Solid Materials (10 hours)** 4.1 Concept of Dual Structure Functional Regions and Packing Factor Model 4.2 Pressure Regulation of Structure and Functional Enhancement 4.3 Defect Regulation of Structure and Functional Enhancement 4.4 External Field Regulation of Structure and Functional Enhancement **5. Structural Design and Application of New Inorganic Solid Materials (10 hours)** 5.1 Basic Principles of Structural Design for Multifunctional Complex Compounds 5.2 Structural Design of Quantum Materials 5.3 Structural Design of Superconducting Materials 5.4 Structural Design of Electroenergy Materials 5.5 Chemical Bond Construction of Energy-Carrying Molecules

*课程要求 （中文） Requirements	考核方式：撰写论文一篇； 考核标准：基于课程学习的知识及无机固体化学基本理论，撰写无机材料的结构设计与性能优化相关的论文。
*课程要求 （English） Requirements	**Assessment Method:** • Write a research paper **Assessment Criteria:** • Based on the knowledge acquired from the course and the fundamental theories of inorganic solid chemistry, students are required to write a paper focusing on the structural design and performance optimization of inorganic materials.
课程资源 （中文） Resources	《无机材料化学》，林建华、荆西平编著，北京大学出版社
课程资源 （English） Resources	Chemistry of Inorganic Materials, authored by Lin Jianhua and Jing Xiping, published by Peking University Press.
备注 Note	