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） 先进生物功能材料</td></tr>
<tr><td colspan="5">（英文 English） Advanced Biological Functional 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>秋季
Fall</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">英文 English</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="2">负责教师
Person in charge</td><td>姓名 Name</td><td>工号 ID</td><td>单位 School</td><td colspan="2">联系方式 E-mail</td></tr>
<tr><td>窦红静</td><td></td><td></td><td colspan="2">hjdou@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">本课程将从多个尺度下的生命体基本单元及其生物活性出发，以不同尺度中生命物质的活性为主线，探讨在分子、纳米、微米、乃至宏观多尺度下实现生物功能性的途径。课程将涵盖与生物功能材料相关的概念、模型及方法，并对生物功能材料在疾病诊断、药物输运、及现代工业中的应用进行介绍。课程将结合生物功能材料的基本原理与相关领域的前沿进展，使学生不仅掌握和了解生物功能材料的设计理念、制备方法、表征手段与前沿应用，还具备如何根据相关领域的应用需求，进行材料的设计和功能性调控、进而实现其生物活性的能力。本门课程的学习将培养先进生物功能材料的设计、制备与性能评估等方面的知识和能力。</td></tr>
<tr><td>*课程简介
（English）</td><td colspan="5">This course will start from the basic units of life and their biological activities in multiple scales, and take the activities of life substances in different scales as the</td></tr>
</table>

Course Description	main line to explore the ways to achieve biological functionality in molecular, nano-, micro- and even macro- scales. The course will cover the concepts, models and methods related to biological functional materials, and introduce the application of biological functional materials in disease diagnosis, drug delivery and modern industry. The course will combine the basic principles of biological functional materials and the cutting-edge progress in related fields, so that students can not only understand the design concept, preparation method, characterizations and cutting-edge applications of biological functional materials, but also have the ability to design materials, regulate their functionality and realize their biological activities according to the application requirements in related fields. This course will cultivate the knowledge and ability in the design, preparation and performance evaluation of advanced biological functional materials.
*教学大纲 (中文) Syllabus	本课程属于材料科学与生物、化学等学科交叉的前沿方向，也是国际材料领域近期的主要研究热点之一。课程共 32 学时，主要围绕多尺度下实现材料生物功能性与生物活性的核心问题，在讲解基本概念的同时，强调材料从纳米至微米、乃至宏观等多个尺度的性能对其生物功能的影响，并着重介绍先进生物功能材料在疾病诊断、治疗及现代工业中的应用。课程内容建设主要包括以下 8 个方面: 1．先进生物功能材料概论（2 课时） 1.1 生物功能材料的发展历程（1 课时） 1.2 现代生物功能材料的发展趋势(1 课时) 2. 天然生物功能材料（4 课时） 2.1 小分子天然生物材料（1 课时） 2.2 大分子天然生物材料（1 课时） 2.3 来自生物体的陶瓷材料（2 课时） 3. 生物纳米材料（6 课时） 3.1 生物纳米材料的设计 （1 课时） 3.2 生物纳米材料的制备 （1 课时） 3.3 生物纳米材料的应用 （2 课时） 3.4 仿病毒纳米载体制备实验（2 课时） 4. 仿细胞功能材料（4 课时） 4.1 仿细胞功能材料的设计理念（1 课时） 4.2 仿细胞功能材料的制备与表征（1 课时） 4.3 人工仿细胞微囊的制备实验（2 课时） 5. 生物活性陶瓷及其应用 （4 课时） 5.1 生物活性陶瓷制备与表征 （1 课时） 5.2 生物活性陶瓷的应用（1 课时） 5.3 生物陶瓷制备实验（2 课时）

	6. 先进生物功能材料与疾病诊断 （4 课时） 6.1 先进生物材料的多功能化（2 课时） 6.2 先进生物功能材料在疾病诊断中的应用 （2 课时） 7. 先进生物功能材料与药物输运 （4 课时） 7.1 药物输运与控制释放（2 课时） 7.2 先进生物功能材料在药物输运中的应用（2 课时） 8. 先进生物功能材料与现代工业 （4 课时） 8.1 生物功能材料在海洋工程中的应用（2 课时） 8.2 生物功能材料在环境工程中的应用（2 课时）
*教学大纲 (English) Syllabus	This course belongs to the interdisciplinary frontier between materials science, biology, and chemistry, *etc*, and it is also one of the hot topics related to materials. The course has 32 class hours. It focuses on the core topics of realizing the biological function and biological activity of materials in multi-scales. While explaining the basic concepts, it emphasizes the influence of the performance of materials from nano to micro, and even macro scales on their biological functions, and focuses on the application of advanced biological functional materials in disease diagnosis, treatment and modern industry. The course content mainly includes the following 8 parts: 1. Introduction to advanced biological functional materials (2 class hours) 1.1 Development history of biological functional materials (1 class hour) 1.2 The trend of development of biological functional materials (1 class hour) 2. Natural biological functional materials (4 class hours) 2.1 Small molecular natural biomaterials (1 class hour) 2.2 Macromolecular natural biomaterials (1 class hour) 2.3 Ceramic materials from organisms (2 class hours) 3. Biological nano-materials (6 class hours) 3.1 Design of biological nano-materials (1 class hour) 3.2 Preparation of biological nano-materials (1 class hour) 3.3 Application of biological nano-materials (2 class hours) 3.4 Experiment: Preparation of virus-like nano-carrier (2 class hours) 4. Cell-like functional materials (4 class hours) 4.1 Design concept of cell-like functional materials (1 class hour) 4.2 Preparation and characterization of cell-like functional materials (1 class hour) 4.3 Experiment: preparation experiment of artificial cell-like microcapsules (2 class hours) 5. Bioactive ceramics and its application (4 class hours) 5.1 Preparation and characterization of bioactive ceramics (1 class hour)

	5.2 Application of bioactive ceramics (1 class hour) 5.3 Experiment: Bioceramic preparation (2 class hours) 6. Advanced biological functional materials and disease diagnosis (4 class hours) 6.1 Multi-functionality of advanced biomaterials (2 class hours) 6.2 Application of advanced biological functional materials in disease diagnosis (2 class hours) 7. Advanced biological functional materials and drug delivery (4 class hours) 7.1 Drug delivery and controlled release (2 class hours) 7.2 Application of advanced biological functional materials in drug delivery (2 class hours) 8. Advanced biological functional materials and modern industry (4 class hours) 8.1 application of biological functional materials in marine engineering (2 class hours) 8.2 application of biological functional materials in environmental engineering (2 class hours)
*课程要求（中文）Requirements	课程将采用“围绕生物功能材料的前沿研究与应用拓展基础理论与知识进行教学”的理念，将课堂理论教学与实验、实践和前沿科研进展相结合。在材料应用中采用“案例教学”的方式，每个环节的教学均将设计 1-2 的前沿应用实例，结合前沿研究的典型案例让学生从关乎国计民生的实例中了解将基础知识应用于前沿实践，从而在实际应用和亲身操作中加深对知识的理解和掌握，培养和掌握围绕实际应用需求设计材料生物功能性的能力。授课形式将有机结合课堂教学、项目实验、实验报告、分组讨论、动画演讲、实物展示、课堂讲演等多种方式。课程考核将采用课程演讲、课堂互动、实验课、课堂师生互动等相结合的方式来综合、全面地评价学生对相关基础知识和前沿研究的掌握。 最终成绩（100%）=课堂师生互动（10%）+实验课（30%）+课程论文写作（40%）+课程论文演讲（20%）
*课程要求（English）Requirements	The course will adopt the concept of "expanding basic theory and knowledge around the frontier research of biological functional materials", and combine classroom teaching with experiment and practice. In the application of materials, "case teaching" method is adopted. Each core content includes 1-2 cutting-edge application examples. Combined with the typical cases of cutting-edge research, students can understand and apply the basic knowledge to cutting-edge practice from the cases related to national economy and people's livelihood, so as to deepen the understanding and mastery of knowledge in practical application, and cultivate the capability of designing biological function of materials for their real applications. The teaching methods will include teaching in classroom, experiments, course project, course thesis, course speech, *etc*. The course assessment will use a combination of course speech, teacher-student communication, experiments, and course thesis to comprehensively evaluate students' capabilities.

	Final score (100%) = class discussion (10%) + experiments (30%) + course thesis writing (40%) + course thesis speech (20%)
课程资源 （中文） Resources	1. B D (Buddy D) Ratner, Biomaterials Science: An Introduction to Materials in Medicine, 3rd Edition, Amsterdam ; Boston : Elsevier Academic Press, 2013. 2. C Mauli (Chandra Mauli) Agrawal, Introduction to biomaterials: basic theory with engineering applications. 3rd edition, Amsterdam ; Boston : Elsevier Academic Press ISBN: 0123746264 (hbk.), 2013 3. Moones Rahmandoust, and Majid R. Ayatollahi, Nanomaterials for Advanced Biological Applications, Springer. 4. Zhao Qin, Leon Dimas, David Adler, Graham Bratzel and Markus J Buehler, Biological materials by design, J. Phys.: Condens. Matter 26 (2014) 073101 (13pp)
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备注 Note	