# 上海交通大学研究生专业课程信息收集表

## Information Form for SJTU Graduate Profession Courses

<table>
<tr><th colspan="6">课程基本信息 Basic Information</th></tr>
<tr><td>*课程名称<br>Course Name</td><td colspan="5">（中文 Chinese）智能高分子材料及应用<br>（英文 English）Smart Polymeric Materials and Applications</td></tr>
<tr><td>*学分<br>Credits</td><td>2</td><td>*学时<br>Teaching Hours</td><td colspan="3">32（1 学分=16 课时）</td></tr>
<tr><td>*开课学期<br>Semester</td><td>秋季学期 Fall</td><td>*是否跨学期<br>Cross-semester?</td><td>否 No</td><td colspan="2">跨 Spanning over 个学期<br>Semesters（含夏季学期）。</td></tr>
<tr><td>*课程类型<br>Course Type</td><td>任意选修课 Elective Course</td><td>*课程分类<br>Course Type</td><td colspan="3">全日制课程 For full-time students</td></tr>
<tr><td>*课程性质<br>Course Category</td><td>专业课 Specialized Course</td><td>课程层次<br>Targeting Students</td><td colspan="3">硕博共用 All graduates</td></tr>
<tr><td>*授课语言<br>Instruction Language</td><td>英文 English</td><td>主要授课方式<br>Teaching Method</td><td colspan="3">课堂教学 In class teaching</td></tr>
<tr><td>*成绩类型<br>Grade</td><td>等第制 Letter grading</td><td>主要考核方式<br>Exam Method</td><td colspan="3">笔试 Written Exam</td></tr>
<tr><td>*开课院系<br>School</td><td colspan="5">材料科学与工程学院</td></tr>
<tr><td>所属学科<br>Subject</td><td colspan="5"></td></tr>
<tr><td rowspan="2">负责教师<br>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>冯传良</td><td></td><td colspan="2">材料科学与工程学院</td><td>clfeng@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<br>(中文)<br>Course Description</td><td colspan="5">（分段概述课程定位、教学目标、主要教学内容、先修课程等；不少于 200 字。）<br>本对外场有响应能力的智能合成材料是目前最令人激动且能引起科研兴趣的新兴研究领域，也是目前尚未开发的商业新兴领域。在这个领域中虽然会面临许多大的挑战，但是高分子材料由于具有结构可设计性的特点使其将来在开发智能高分子材料领域显示出了巨大的潜力。因此，针对智能高分子及其潜在应用这一热点研究领域，本课程对硕士生讲授介绍该类材料最近的事态发展、不同外场响应的高分子体系、未来的发展趋势等。以达到使学生对外场响应高分子合成制备、修饰及应用等有深刻的理解和认识，也为将来培养在该领域的研究和应用型人才做准备。</td></tr>
<tr><td>*课程简介<br>（English）<br>Course Description</td><td colspan="5">（须与中文一致，翻译请力求信达雅。）<br>This intelligent synthetic material with field response ability is the most exciting and interesting new research field, and it is also a new commercial field that has not been developed yet. Although there will be many challenges in this field, polymer materials show great potential in the development of intelligent polymer materials in the future due to their structural designability. Therefore, aiming at the hot research field of intelligent polymer and its potential application, this course introduces the recent development of this kind of materials, polymer systems with different field response, future development trend, etc. In order to enable students to have a deep understanding and understanding of the preparation, modification and application of field response polymer synthesis, and prepare for the future training of research and application talents in this field.</td></tr>
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| *教学大纲<br>(中文)<br>Syllabus | （建议列表形式，各列内容：章节、主要内容、课时数、教学方式等）<br>第一讲：智能高分子材料的进展和现状 （2 个学时，课堂授课）<br>第二讲：智能高分子刷制备、转换、机理及应用（2 个学时，课堂授课）<br>第三讲：双亲性智能高分子的制备及应用（4 个学时，课堂授课）<br>第四讲：电化学方法制备智能高分子材料：从基础到功能化研究（2 个学时，课堂授课）<br>第五讲：智能高分子单层膜生物技术工程（2 个学时，课堂授课）<br>第六讲：化学响应的智能高分子纳米颗粒、纳米凝胶和胶囊作为多功能智能材料（4 个学时，课堂授课）<br>第七讲：具有生物活性的智能高分子纳米复合材料（2 个学时，课堂授课）<br>第八讲：智能高分子纳米复合材料表界面功能的研究（4 个学时，课堂授课）<br>第九讲：具有智能自愈合能力的外场响应高分子（2 个学时，课堂授课）<br>第十讲：基于纳米技术和智能高分子之上的生物分子机器人（2 个学时，课堂授课）<br>第十一讲：智能高分子材料的未来发展前景及挑战（2 个学时，课堂授课）<br>第十二讲：讨论课：对智能高分子材料的全面认识。同时写关于智能高分子材料制备、修饰及应用的报告。（2 个学时，课堂授课）<br>第十三讲：讨论课：智能高分子材料的一般制备方法及其应用。学生写关于该领域的报告。（2 个学时，课堂授课） |
| *教学大纲<br>（English）<br>Syllabus | **Contents**<br>*(The time for group discussion and presentation is included in the duration for each unit)*<br><br>**1 Introduction: Recent advances and challenges in designing stimuli-responsive polymers**<br>Synthetic materials capable of responses to external or internal stimuli represent one of the most exciting and emerging areas of scientific interest and unexplored commercial applications. While there are many exciting challenges facing this field, there are a number of opportunities in design, synthesis, and engineering of stimuli-responsive polymeric systems and Mother Nature serves as a supplier of endless inspirations.<br>One 1.5 h classes<br><br>**2 Stimuli-responsive molecular brushes**<br>The course focuses on the general aspects of molecular brushes and polymeric responsive systems. Rational approaches to induce stimuli-responsiveness in molecular brush systems are highlighted.<br>One 1.5 h classes<br><br>**3 Stimuli-responsive amphiphilic (co)polymers via RAFT polymerization**<br>The course focuses specifically on advances in the synthesis of (co)polymers from water-soluble monomers yielding stimuli-responsive systems. Additionally, we focus on recent reports of assembly into micelles and polymersomes induced by external stimuli including temperature, pH, and ionic strength. Reversible cross-linking methods to “lock” such assembled morphologies are addressed as well as potential applications in nanomedicine.<br>Two 1.5 h classes<br><br>**4 Stimulus-responsive polymer brushes on surfaces: Transduction mechanisms and applications** |

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| | This course summarizes selected, recent progress in SRPB applications in the field of surface wettability switching, mechanical actuation, and environmental sensing.Furthermore,wereview selected papers from an emerging area in which SRPBs are used for nano- and microfabrication.<br>one 1.5 h classes<br><br>**5 Cathodic electrografting of acrylics: From fundamentals to functional coatings**<br>This remarkable progress that largely relies on advanced controlled polymerization processes will be focused, with a special emphasis on the more recent development of smart coatings, particularly stimuli responsive coatings very well-suited to nanotechnologies.<br>One 1.5 h classes<br><br>**6 Stimuli-responsive monolayers for biotechnology**<br>This course focus on recent advances in stimuli-responsive materials specifically focusing on monolayers formed by molecules such as peptides and oligonucleotides and their applications in biotechnology.<br>Two 1.5 h classes<br><br>**7 Stimuli-responsive nanoparticles, nanogels and capsules for integrated multifunctional intelligent systems**<br>The course consists of two major parts: synthesis and applications of nanoparticles in colloidal dispersions, thin films, delivery devices and sensors. We also broadly discuss potential directions for further developments of this research area.<br>One 1.5 h classes<br><br>**8 Biomimetic mechanically adaptive nanocomposites**<br>This course focuses the development of a new family of artificial polymer nanocomposites that mimic the architecture and the mechanic adaptability of the sea cucumber dermis.<br>Two 1.5 h classes<br><br>**9 The world of smart healable materials**<br>This course will present a comprehensive view of the field of stimuli-responsive healable materials.<br>One 1.5 h classes<br><br>**10 Biomolecular motors at the intersection of nanotechnology and polymer science**<br>This course focuses on the contributions involving the use of linear biomolecular motors, kinesin and myosin, and their associated filaments, microtubule and actin, in device applications.<br>One 1.5 h classes<br><br>**11 Future perspectives and recent advances in stimuli-responsive materials**<br>Two 1.5 h classes<br>**12 Discussion course about overview of smart polymer materials. Writing a related report.**<br>One 1.5 h classes<br><br>**13 Discussion course about general methods to make smart polymers and their application. Writing a related report**<br>One 1.5 h classes |
| *课程要求<br>（中文）<br>Requirements | （课程考核方式、考核标准等；不少于 50 字）<br>1 保证完成所有课程的正常出勤率<br>2 针对智能高分子材料，完成至少一次课堂 PPT 报告<br>3 至少完成两次智能高分子材的报告 |

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| | 4 期末考试达标 |
| *课程要求<br>（English）<br>Requirements | （须与中文一致，翻译请力求信达雅。）<br>1. Normal attendance rate of all courses<br>2. For intelligent polymer materials, complete at least one classroom ppt Report<br>3. Writing at least two times reports for smart polymeric materials<br>4. Pass final exam |
| *课程资源<br>（中文）<br>Resources | （教材、教参、网站资料等。）<br>1. Liu F, Urban MW, *Recent advances and challenges in designing stimuli-responsive polymers*, Prog. Polym. Sci. **2010**; 35; 3-23.<br>2. UrbanMW. *Stratification, stimuli-responsiveness, self-healing, and signaling in polymer networks*. Prog Polym Sci **2009**;34:679–87.<br>3. Urban MW, Lestage DJ. *Colloidal particle morphology and film formation, the role of bio-active components on stimuli-responsive behavior*. Polym Rev **2006**;46:445–66.<br>4. Saha K, Pollock JF, Schaffer DV, Healy KE. *Designing synthetic materials to control stem cell phenotype.* Curr Opin Chem Biol **2007**;11:381–7.<br>5. Urban MW. *Intelligent polymeric coatings, current and future advances.* Polym Rev **2006**;46:329–39.<br>6. Kamath KP, Park K. *Biodegradable hydrogels in drug delivery.* Adv Drug Deliv Rev **1993**;11:59–84. |
| *课程资源<br>（English）<br>Resources | （须与中文一致，请力求信达雅。）<br>1. Liu F, Urban MW, *Recent advances and challenges in designing stimuli-responsive polymers*, Prog. Polym. Sci. **2010**; 35; 3-23.<br>2. UrbanMW. *Stratification, stimuli-responsiveness, self-healing, and signaling in polymer networks*. Prog Polym Sci **2009**;34:679–87.<br>3. Urban MW, Lestage DJ. *Colloidal particle morphology and film formation, the role of bio-active components on stimuli-responsive behavior*. Polym Rev **2006**;46:445–66.<br>4. Saha K, Pollock JF, Schaffer DV, Healy KE. *Designing synthetic materials to control stem cell phenotype.* Curr Opin Chem Biol **2007**;11:381–7.<br>5. Urban MW. *Intelligent polymeric coatings, current and future advances.* Polym Rev **2006**;46:329–39.<br>6. Kamath KP, Park K. *Biodegradable hydrogels in drug delivery.* Adv Drug Deliv Rev **1993**;11:59–84. |
| 备注<br>Note | |