Information Form for SJTU Graduate Profession Courses

<table>
<tr><th colspan="6">Basic Information</th></tr>
<tr><td rowspan="2">* Course Name</td><td colspan="5">Chinese</td></tr>
<tr><td colspan="5">English Supramolecular materials and Biomedical applications</td></tr>
<tr><td>* Credits</td><td>2</td><td>* Teaching Hours</td><td colspan="3">32 1 =16</td></tr>
<tr><td>* Semester</td><td>Fall</td><td>* Cross-semester?</td><td>No</td><td colspan="2">Spanning over Semesters</td></tr>
<tr><td>* Course Type</td><td>Program Elective Course</td><td>* Course Type</td><td colspan="3">For full-time students</td></tr>
<tr><td>* Course Category</td><td>Specialized Course</td><td>Targeting Students</td><td colspan="3">All graduates</td></tr>
<tr><td>* Instruction Language</td><td>English</td><td>Teaching Method</td><td colspan="3">In class teaching</td></tr>
<tr><td>* Grade</td><td>Letter grading</td><td>Exam Method</td><td colspan="3">Written Exam</td></tr>
<tr><td>* School</td><td colspan="5"></td></tr>
<tr><td>Subject</td><td colspan="5"></td></tr>
<tr><td rowspan="2">Person in charge</td><td>Name</td><td>ID</td><td>School</td><td colspan="2">E-mail</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">hjdou@sjtu.edu.cn</td></tr>
<tr><th colspan="6">Extended Information</th></tr>
<tr><td>* ( ) Course Description</td><td colspan="5">200
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<tr><td>* English Course Description</td><td colspan="5">Course Description
Supramolecular science is an exciting area of science that plays a central role in bringing different disciplines together, ranging from molecular medicine to nanotechnology. Materials science based on supramolecular interactions is an emerging field, which has made important steps forward in the recent twenty years. Much afford is put into the development of supramolecular materials with true materials properties, both in solution and in the solid state. These supramolecular materials are beginning to reach the market in all kind of applications, especially in</td></tr>
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	biological applications. According to the principle of biomedical materials, ideal biomaterials do not only have to fulfill the biomaterials trinity of tunable mechanical properties, regulation of the degradability and the ease for bioactivity incorporation, but also have to mimic the natural environment where the materials are brought into. Therefore, a modular, self-assembly approach using several supramolecular building blocks is an exquisite way to produce such “responsive” biomaterials which is popular in natural biological systems. As is implied in title, this course will highlight the principles and fundamentals of supramolecular materials with the emphasis of their application in biomedical fields. The duration of this course is eighteen weeks, with one 1.5-hour sessions per week. (or the duration of this course is nine weeks, with two 1.5-hour sessions per week.) **Course Learning Objectives** Gain fundamental knowledge in supramolecular materials Know the biomedical applications of supramolecular materials Upgrade the glossary and English skill in related field

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Syllabus

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* English Syllabus	**1** ***Introduction*****: Supramolecular Materials and its main directions.** The size-property relationship (single molecule – nano-sized object – bulk material). Compounds, mixtures, phases and materials. Supramolecular, nanostructured and hybrid materials. One 1.5 h classes **2** ***Non-valent interactions***. Weak vs labile interactions. Coordination bonds. Hydrogen bonds. Etter's rules. Self-assembly. Supramolecular synthon. Molecular tectonics. Van der Waals interactions. Molecular crystals. Van der Waals radii. Packing efficiency and energy of molecular crystal frameworks. Design of new host geometries. One 1.5 h classes **3** ***Oligomolecular associates*****.** Molecular clathrates. Self-assembling capsules and rosettes. *Macrocyclic receptors*: crown-ethers, cyclodextrins, calixarenes and others. Template effect. Preorganization. Host-guest complementarity. Binding of ions and molecules in solution. Supramolecular catalysis and enzyme mimics. Two 1.5 h classes **4** ***Supramolecular structures with macromolecules***. Functional coordination polymers. Porous metal-organic frameworks. Confined spaces in solids as nanoreactors. Two 1.5 h classes **5** ***Physico-chemical basis*** for the formation of supramolecular phases driven by thermodynamics. Sorption, clathration, encapsulation and other types of inclusion behavior. The theory of clathrate formation. The formation of co-crystals and packing complexes. Pharmaceutical co-crystals. Blue reaction of iodine. Two 1.5 h classes **6** ***Chemosensors*** Synthetic Receptors in Analytical Sensing Applications Two 1.5 h classes **7** ***Selective Ion Recognition with Durable Sensors*** Ion Separations in Membrane and Solid Phase Extraction Systems Two 1.5 h classes **8** ***Methods used to study structure and properties of supramolecular materials*** overview. X-ray crystallography. Big unit cells, superstructure and modulation in crystals. Supercrystals. Solution and solid-state NMR. Thermal analysis. Phase diagrams. Sorption experiments. Two 1.5 h classes **9** ***Porphyrin- and Expanded Porphyrin-Based Diagnostic and Therapeutic Agents*** One 1.5 h classes **10** ***Molecular devices***. Biological mimics. One 1.5 h classes

* Requirements	50 PPT 30% PPT 30% 40%
* English Requirements	Speech 30% ; Presentation 30%; Final exam (end of term): 40%.
* Resources	1. Supramolecular chemistry, Chichester, U.K. : Wiley 2nd ed. 2009. 2. Self-Assembly in Supramolecular Systems, L. F. Lindoy, I. M. Atkinson, The Royal Society of Chemistry 2000. 3. Supramolecular Polymers, Edited by A. Ciferri, Marcel Dekker, Inc. 2000. Homepage in Canvas system during the teaching term.
* English Resources	1. Supramolecular chemistry, Chichester, U.K. : Wiley 2nd ed. 2009. 2. Self-Assembly in Supramolecular Systems, L. F. Lindoy, I. M. Atkinson, The Royal Society of Chemistry 2000. 3. Supramolecular Polymers, Edited by A. Ciferri, Marcel Dekker, Inc. 2000. Canvas
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