

Basic Information				
* Course Name	Chinese			
	English Hydrogen Technology and Materials			
* Credits	3	* Teaching Hours	48 1 16	
* Semester	Fall	* Cross-semester?	No	Spanning over Semesters
* Course Category	Specialized Course	* Course Type	For full-time students	
* Instruction Language	Chinese	Teaching Method	In class teaching	
* Grade	Letter grading	Exam Method	Essay	
* School				
Subject				
Person in charge	Name	ID	School	E-mail
				juanchen@sjtu.edu.cn
Extended Information				
* () Course Description	200			

<p style="text-align: center;">* English Course Description</p>	<p>This course focuses on the current hot research fields of hydrogen energy, including hydrogen production, hydrogen storage, hydrogen utilization and hydrogen safety technologies. This course will thoroughly and comprehensively cover the physical chemistry and material science theories on electrocatalysis, photocatalysis, photoelectric (thermal) conversion, fuel cell, hydrogen sensitivity and hydrogen embrittlement, as well as the design optimization from raw materials to system. This course will start from the basic concepts and principles of physicochemistry and material science of related reactions, and combine the academic foreground and practical examples of theoretical prediction through material calculation, material experiment, elementary material design and device integration optimization.</p> <p>This course combines the theoretical knowledge with the latest development of each branch discipline field, and strengthens the ability of students to discover, analyze and solve problems based on the problem orientation. At the same time, the course follows the laws of development and innovation of physical chemistry related to emerging hydrogen energy, emphasizing the understanding and utilizing of new principles, new knowledge, new achievements and new applications.</p> <p>After the course, students are expected to master the overall development of hydrogen energy field, relevant technologies and core materials, clarify the path branches of hydrogen energy technology, advantages, disadvantages application scope and conditions of various technical schemes, and understand the latest hydrogen energy technology. It is hoped that a group of outstanding talents with solid professional knowledge, innovation, national pride and international vision and competitiveness for Chinese hydrogen industry will be cultivated by this course.</p>
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<p style="text-align: center;">* () Syllabus</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;">1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">+</td> </tr> <tr> <td rowspan="7"></td> <td></td> <td></td> <td style="text-align: center;">1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">—</td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">—</td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="6"></td> <td></td> <td></td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="4"></td> <td></td> <td></td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>														1						+				1									4								—	2								—	2									2									1									1										2									2									2									2									3									1										2									2									2									2						
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Chapter	Content	Hours	Form	Instructor
Chapter 1 Introduction	Introduction to the course	1	Narration and interaction	Juan Chen+ Authoritative expert
Chapter 2 Hydrogen Production	Overview of Hydrogen Production Technologies	1	Narration and interaction	Fang Song
	Introduction to Water Splitting	4	Narration and interaction	Fang Song
	Hydrogen Evolution Catalysts at Cathode	2	Narration and interaction	Fang Song
	Oxygen Evolution Catalysts at Anode	2	Narration and interaction	Fang Song
	Photocatalysts and Photoelectrocatalysts	2	Narration and interaction	Fang Song
	Electrolyzer for Water Splitting	1	Narration and interaction	Fang Song
	Assembling and Testing of Electrolyzer for Water Splitting	1	Experimental lesson	Fang Song
Chapter 3 Hydrogen storage	Introduction to the hydrogen storage technology and related materials, methods, applications and mechanism	2	Narration and interaction	Jianxin Zou
	High pressure hydrogen storage and related storage tank, valve and pipeline materials	2	Narration and interaction	Jianxin Zou
	Low temperature liquid hydrogen storage and related heat insulation materials	2	Narration and interaction	Jianxin Zou
	Solid state hydrogen storage and related materials	2	Narration and interaction	Jianxin Zou
	Hydrogen storage and transportation: Current states, challenges and perspectives	3	Narration and interaction	Jianxin Zou
	Mg based solid hydrogen storage materials: Hydrolysis and thermal decomposition properties	1	Experimental lesson	Jianxin Zou
Chapter 4	Introduction to Fuel Cell	2	Narration and interaction	Jianbo Wu

* English Syllabus

	Fuel Cell	ORR Catalytic Materials at Cathode	2	Narration and interaction	Jianbo Wu
		HOR Catalytic Materials at Anode	2	Narration and interaction	Jianbo Wu
		Membrane and Bipolar plate	2	Narration and interaction	Jianbo Wu
		Operation and Failure Analysis of Fuel Cell	2	Narration and interaction	Jianbo Wu
		Fabrication and Evaluation of MEA	1	Experimental lesson	Jianbo Wu
	Chapter 5 Hydrogen safety	Technology and materials of hydrogenation station	2	Narration and interaction	Juan Chen + Industry expert
		Overview and basic theory of hydrogen safety management	2	Narration and interaction	Juan Chen
		Technology and materials for hydrogen detection	3	Narration and interaction	Juan Chen
		Material safety in hydrogen environment	3	Narration and interaction	Juan Chen
		Optical performance test of hydrogen detection material	1	Experimental lesson	Juan Chen
*	50				
Requirements	100 5 PPT 20 + 30 + 20 + 20 + 10				
* English Requirements	Total score: 100 points (Final presentation 20% + Final thesis 30% + Homework 20% + Attendance 20% + Experiment 10%)				
Resources	<ol style="list-style-type: none"> 1. Kazunari Sasaki, Hai-Wen Li, Akari Hayashi, Junichiro Yamabe, Teppei Ogura, Stephen M. Lyth: Hydrogen Energy Engineering, Springer, 2016. 2. Paulo Emilio Miranda. Science and Engineering of Hydrogen-Based Energy Technologies: Hydrogen Production and Practical Applications in Energy Generation. Academic Press. 2018. 3. Frano Barbir;Angelo Basile;T. Nejat Veziroglu, Compendium of Hydrogen Energy: Hydrogen Energy, Woodhead Publishing, 2015. 4. Bent Sorensen, Giuseppe Spazzafumo, Hydrogen and Fuel Cells: Emerging Technologies and Applications. Academic Press. 2018. 5. , , . 2018. 6. , , , . 2018. 7. [] . , , . 2009. 				
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Resources	
Note	