上海交通大学硕士研究生课程教学大纲

<table>
<tr><td colspan="6">课程基本信息（Course Information）</td></tr>
<tr><td>课程代码
(Course Code)</td><td>PE8621</td><td>*学时
(Credit Hours)</td><td>32</td><td>*学分
(Credits)</td><td>2</td></tr>
<tr><td rowspan="2">*课程名称
(Course Name)</td><td colspan="5">（中文）新型物理储能技术及应用</td></tr>
<tr><td colspan="5">（英文）Advanced Physical Energy Storage Technology and Applications</td></tr>
<tr><td>课程性质
(Course Type)</td><td colspan="5">专业前沿课，Program Frontier Course</td></tr>
<tr><td>授课语言
(Language of Instruction)</td><td colspan="5">英文，English</td></tr>
<tr><td>*开课院系
(School)</td><td colspan="5">中英国际低碳学院，China-UK Low Carbon College</td></tr>
<tr><td>先修课程
(Prerequisite)</td><td colspan="5"></td></tr>
<tr><td>授课教师
(Teacher)</td><td colspan="2">汪凯，Kai Wang</td><td>课程网址
(Course Webpage)</td><td colspan="2"></td></tr>
<tr><td>*课程简介</td><td colspan="5">本课程为中英国际低碳学院“氢能与储能”研究生专业前沿课程，着重介绍物理方式的储能技术，主要包括机械储能及储热的原理，关键技术，以及应用前景。课程主要内容包括储能技术的背景和意义，各储热技术包括显热、潜热（相变）和热化学，以及机械储能技术包括压缩空气储能、飞轮和抽水蓄能等储能方式的原理和计算、新型材料、系统方案和工程应用，物理储能与可再生能源，以及物理储能在电力及建筑等行业的应用。</td></tr>
<tr><td>* Description</td><td colspan="5">This course focuses on the theory and application of physical energy storage including mechanical and thermal energy storage, is the Frontier Course for the MSc Program “Hydrogen Energy and Energy Storage” in China-UK Low Carbon College, Shanghai Jiao Tong University. Special attention will be paid to the new materials, key technology and system integration, latest engineering application and future perspectives of different energy storage technologies. The major content of this course includes the background and significance of energy storage technologies, the mechanisms, modelling and calculation, new materials and engineering system of different thermal energy storage systems including sensible heat, latent heat (phase change) and thermal chemical energy storage technologies, and different mechanical energy storage systems including compressed air, pumped hydro and flywheel technologies, physical energy storage and renewable energy, and the application of physical energy storage in power plant and building industries.</td></tr>
<tr><td colspan="6">课程教学大纲（Course Syllabus）</td></tr>
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*学习目标 (Learning Outcomes)	• Understand the social demand of energy and physical energy storage • Understand the mechanisms and developments of each physical energy storage technology • Distinguish the key characteristics, breakthrough point and future application perspectives in different sectors for each physical energy storage technology • Identify the significance of physical energy storage technologies for carbon neutrality
*教学内容、进度安排及要求 (Class Schedule & Requirements)	**2 Hours per week** Week 1: Introduction, mainly to introduce the background and significance of energy storage technologies Week 2: Fundamentals of Physical Energy Storage, mainly to describe the mechanisms, categories and latest development of physical energy storage technologies Week 3-5: Thermal Energy Storage, mainly to describe the mechanisms, modelling and calculation, new materials and system, as well as case engineering case studies and applications of thermal energy storage Week 6-7: Compressed Air Energy Storage, mainly to describe the mechanisms, modelling and calculation, new systems, as well as case studies and applications of compressed air energy storage Week 8: Other mechanical energy storage: Flywheel and Pumped Hydro, mainly to describe the mechanisms, history, new case studies and applications of flywheel and pumped hydro energy storage Week 9-11: Physical Energy Storage and Renewable Energy, mainly to introduce how to use the latest developments energy storage technologies to maximise the utilisation of renewable energy Week 12-13: Applications of Physical Energy Storage, mainly to introduce the applications of physical energy storage in different industries, such as power plants and building thermal energy demand Week 14: Modeling of Energy Storage Systems Week 15-16: Summary/Industry Practice; Student Presentations
*考核方式 (Grading)	20% in class performance; 30% assignment; 50% Oral Presentation; In class performance: mainly depends on the students attendance and the involvement and engagement in class; Assignment: mainly to help the students enhance their understandings on the fundamentals of physical energy storage system. Oral Presentation: the student will be asked to choose/design one application of physical energy storage, describe its mechanism and key breakthrough point, possible improvements/future development, and how it will contribute to the carbon neutral for certain industry or certain area. The examination aims to reflect and examine the major outcomes of the class. It includes two parts. On one hand, the student must show good leaning feedback, the understanding and utilization of the theory, the ability to summaries literatures and identify the key question; On the other hand, he or she also needs to have good presentation skills.

*教材或参考资料 (Textbooks & Other Materials)	
其它 (More)	
备注 (Notes)	

备注说明：

1.课程大纲一般为教师网上填写，填写要求会自动提示；对于新开课程，需要填着纸质大纲，并经院系教学委员会或专业委员会通过。

2．带*内容为必填项。

3．课程简介字数为 300-500 字；课程大纲以表述清楚教学安排为宜，字数不限。