**上海交通大学硕士研究生课程教学大纲**

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| 课程基本信息（Course Information） | | | | | | | |
| 课程代码  （Course Code） |  | \*学时  （Credit Hours） | 48 | \*学分  （Credits） | | 3 | |
| \*课程名称  （Course Name） | （中文）高等工程热力学 | | | | | | |
| （英文）Advanced Engineering Thermodynamics | | | | | | |
| 课程性质  (Course Type) | 选修课 Optional | | | | | | |
| 授课语言  (Language of Instruction) | 英文 English | | | | | | |
| \*开课院系  （School） | 中英国际低碳学院 China-UK Low Carbon College | | | | | | |
| 先修课程  （Prerequisite） | 工程热力学 Engineering Thermodynamics | | | | | | |
| 授课教师  （Teacher） | 杜艳平 DU YANPING | | 课程网址  (Course Webpage) | | NA | |
| \*课程简介（Description） | Fundamentals of Engineering Thermodynamics are introduced. These include the basic concepts and the First & Second Laws of thermodynamics as well as the analytical methods based on entropy/ enthalpy. Another focus of the course lies in the elaborations of diverse experimental measurements and theoretical calculations of thermodynamic properties for different working fluids. As the key element, thermodynamic cycles such as steam/ gas driven dynamic cycle, refrigerating/ heat pump cycle, and gas compression cycle are substantially demonstrated to promote the understanding of the heat-to-power conversion. To better fit the practical conditions in engineering, this course also covers the thermodynamic fundamentals in multi-component systems, non-equilibrium systems, and featured systems with magnetic media, chemical reactions or thermal radiation, etc. | | | | | | |
| \*课程简介（Description） |  | | | | | | |
| 课程教学大纲（course syllabus） | | | | | | | |
| \*学习目标(Learning Outcomes) | 1. 深刻理解高等工程热力学基本概念，熟练掌握热力学第一、第二定律，和熵、火用分析方法；  2. 理解流体工质的热力学函数间联系，掌握热力学性质的实验测定方法和理论计算方法，了解实际气体状态方程及热力性质的计算方法；  3. 深刻理解多组分单相、多相系统的热力函数，广延性质和基本原理；  4. 了解特殊系统的热力学基础，包括简单弹性力系统，表面薄膜系统，简单磁介质系统，含化学反应和燃烧反应的系统，了解燃料电池、辐射的热力学基础；  5. 掌握基本热力循环基本知识及性能评价方法，重点掌握蒸汽动力循环，气体动力循环，制冷和热泵循环，以及气体压缩循环的基本原理和实验、计算方法；  6. 了解非平衡态不可逆过程的热力学基础，了解非平衡态辐射热力学基础。  1. Thoroughly understand basic concepts and principles, the first and second laws in Advanced Engineering Thermodynamics; master the analytical methods based on entropy and enthalpy;  2. Understand the relations of thermodynamic functions, master the experimental measurements/ theoretical assessments of thermodynamic properties; learn about the methods for approximately evaluating the properties for real gas;  3. Basic properties of single/multiphase fluid in multi-components systems;  4. Fundamentals of special thermodynamic systems; fundamentals of fuel cells and thermodynamic systems with thermal radiation;  5. Basic knowledge and methods in thermodynamic cycles, including steam/ gas dynamic cycles, refrigeration and heat pump cycles and gas-compression cycles;  6. Learn about fundamentals of irreversible non-equilibrium processes. | | | | | | |
| \*教学内容、进度安排及要求  (Class Schedule  & Requirements) | |  |  |  | | --- | --- | --- | | Week 1 | 基本概念  Review-basic concepts | Homework | | Week 2 | 热力学第一定律  The first Law of thermodynamics | Homework | | Week 3 | 热力学第二定律  The second Law of thermodynamics | Homework | | Week 4 | 有效能和有用功  Exergy analysis | Presentation | | Week 5 | 热力学函数间的普遍关系式relations of thermodynamic functions | Homework | | Week 6 | 热力学性质的实验测定  Measurements of thermal properties | Presentation | | Week 7 | 实际气体的状态方程  State equations for real gas | Homework | | Week 8 | 工质热力性质的计算  Basic calculations for thermodynamic properties | Homework | | Week 9 | 流体工质热力性质的推算  Derivation of thermodynamic properties | Presentation | | Week 10 | 热力循环组织及其性能评价方法  The assessment of thermodynamic cycles | Homework | | Week 11 | 蒸汽动力循环与气体动力循环  Steam/ gas -driven dynamic cycle | Homework | | Week 12 | 制冷和热泵循环与气体压缩循环  Refrigeration, heat pump, gas compression cycles | Presentation | | Week 13 | 含化学反应和燃烧的系统热动力学  Thermodynamics with reaction/ combustion | Homework | | Week 14 | 多组分混合物系统热动力学  Thermodynamics for multi-component systems | Homework | | Week 15 | 不可逆过程的热力学基础  Fundamentals of irreversible processes | Homework | | Week 16 | 非平衡过程的热力学基础  Fundamentals of irreversible processes | Presentation | | | | | | | |
| \*考核方式  (Grading) | 期末考核60%+平时分数40% （其中考勤50%）  Examination 60% + assignments 40% （in which attendances represent 50% ） | | | | | | |
| \*教材或参考资料  (Textbooks & Other Materials) | 1. 高等工程热力学， 第2版， 陈则韶/编著，中国科学技术大学出版社。 2. Advanced Thermodynamics Engineering, Series Editor, J. N. Reddy, Texas A & M University | | | | | | |
| 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。