

东南大学 2021 年国际暑期学校项目

Introduction of SEU International Summer School Program 2021

项目主题(Theme)

低碳建筑能源技术与实践

Low-carbon technologies for Building energy and application

项目概述 (Overview)

针对能源动力、建筑能源与环境领域对国际化人才日益增加的需求，本项目对中国学生和国际学生具有同等的培养作用。本课程面向国内外本科生、本年度外校意向免试研究生，在校外籍研究生留学生等，暑期学校建设目的包括：（1）向国际本科生展示、宣传本校学科专业特色，强化国际交流，特别是推动我校与英国帝国理工学院本科生交流计划；（2）向外校有意向参与我校 2021 免试研究生的本科生提供了解我校学科特色、研究方向的机会，吸引国内一流学科高校生源；（3）针对目前我校外国留学生专业基础不够扎实的问题，通过此课程强化外国留学生专业基础，吸引更多外国留学生来我校深造，推动“一带一路”国家战略。项目包括三门课程，空气调节课程设计 0.5 学分，制冷课程设计 0.5 学分，生产实习 1 学分。

In view of the increasing demand for internationalized talents in the field of energy and power, this project plays an equal role in training Chinese and international students. Distinguished experts from Europe and Australia have been invited to deliver lectures for Refrigeration and Air Conditioning design for low-carbon built environment: Professor Christos Markides from Imperial College London, Professor Xiaolin Wang from the University of Tasmania, Dr. Hongwei Wu from University of Hertfordshire. Three professors will also organize open forums in cutting edge technologies and application. Focusing on practice and innovation, this project will give students opportunity to study advanced low-carbon technologies, building energy and environment in China, UK and Australia, and arrange them to carry out innovative design of refrigeration and air conditioning application for buildings. This project will be run for 20 consecutive working days for 3 courses, which can replace the basic and applied courses of *Design of Air Conditioning*, *Design of Refrigeration System* and *Advanced Practicum*.

课程安排(Schedule)

Course 1: Low-carbon technologies for Built Environment and Design *(Design of Air Conditioning)*

时间 Time	课程内容 Content	授课外教 Lecturer	授课平台 Platform
16/July 8:30-10:30	Introduction – Overview of Energy	Xiaolin Wang	Zoom
16/July 15:30-17:00	Technologies for effective solar energy thermal utilization	Christos Markides	Zoom
17/July 8:30-10:30	Project description- Description of a design project for a residential air-conditioning system	Xiaolin Wang	Zoom
17/July 15:30-17:00	High efficiency energy use via heat recovery, conversion and co-generation	Christos Markides	Zoom
18/July 8:30-10:30	Geothermal heat pump	Xiaolin Wang	Zoom
19/July 8:30-10:30	Thermal circuit theory	Xiaolin Wang	Zoom
20/July 8:30-10:30	Psychometric analysis of air-conditioning system	Xiaolin Wang	Zoom
21/July 14:00-16:00	Heat exchanger design	Xiaolin Wang	zoom
22/July 8:30-10:30	Project consultation	Xiaolin Wang	Zoom
23/July 9:30-11:30	Interactive cross making of the design project	Xiaolin Wang	Zoom
23/July 14:00-16:00	Project presentations	Xiaolin Wang & Yonggao Yin	Zoom

Course description

This course focuses on how to design an energy efficient built environment and analyze energy conservation potential through utilization of renewable energy. Low-carbon technologies and demonstration cases for built environment, such as solar thermal utilization, geothermal heat pump, will be discussed. Some basic knowledge for air conditioning design will also be introduced, such as psychometric analysis of air-conditioning system, heat exchanger design, heat/cooling load evaluation. This course would promote students aware of energy efficiency of green buildings involving leading-edge technologies when making of air conditioning system design.



Lecturer introduction

帝国理工学院 Professor Christos Markides



Christos Markides, 帝国理工学院化学工程系教授, 清洁能源过程实验室主任, *Applied Thermal Engineering* 期刊主编。研究领域包括热能(侧重废热和太阳能)的回收、利用和存储技术及所涉及的热力学、流动和传热传质问题。近5年在国际知名期刊发表SCI论文60余篇, 其中4篇论文入选ESI高被引论文。曾获得 *Applied Energy* 高被引原创论文奖(2017、2018), 英国化学工程师协会全球“最佳研发项目奖”(2018), 帝国理工学院“卓越教学”(2016)和“卓越研究”(2017)校长奖。

Christos Markides is a professor at the Department of Chemical Engineering, Imperial College London, the head of the Clean Energy Processes Laboratory and also the Editor-in-Chief of *Applied Thermal Engineering*. His research interests focus primarily on the application of fundamental principles of thermodynamics, fluid mechanics and heat/mass transfer to high-performance technologies for energy (especially waste heat and solar energy) recovery, utilization (heating/cooling/power) and storage. In the past 5 years, he has published more than 60 SCI-indexed journal papers, 4 of which are ESI Highly Cited Papers. His main awards are *Applied Energy*'s “Most highly cited original paper” award (2017, 2018), IChemE's Global award for “Best Research Project” (2018) and Imperial College London President Awards for Teaching (2016) and Research Excellence (2017).

塔斯马尼亚大学

Professor Xiaolin Wang



Xiaolin Wang, 2005 到 2012 年在西澳大利亚大学机械化工系任职副教授，目前在塔斯马尼亚大学工程学院任副教授，科研副院长，西安交通大学的客座教授。主要从事热力学和流体力学的研究，涉及领域包括热能利用与储存、热驱动空调和海水淡化的研究和开发、冷却系统和能源系统的热力学研究、吸收吸附制冷机的研究和开发、吸附辅助式气体储存及新能源利用等。曾获 2005 年度英国机械工程协会 Ludwig Mond Prize 奖、并连续入选为 2009 年度和 2010 年度澳中青年科学家交流的澳方代表之一，2016 年澳洲日本领军人才项目，2016 年塔斯马尼亚大学科学工程学部杰出科研奖。在国际期刊和国际会议发表论文 170 余篇（H-index 28），并拥有 6 项国际发明专利，其中两项已被公司产业化，主持合作完成了超过 600 万澳币的科研项目。他也是最新的塔大绿色经济合作研究中心（\$329 million）的项目负责人之一，目前担任《The Australian Journal of Mechanical Engineering》副主编。

Professor Wang enjoys his research in cooling and power engineering, energy storage and conversion, desalination and utilization of renewable energy. He was named as Field Leader in Thermal Science by the Australian Research Magazine in 2018. He is a Fellow of Engineers Australia and member of the World Society of Sustainable Energy Technologies. He won the DAAD visiting fellowship by DAAD Germany in 2003 and Ludwig Mond Prize 2005, by the Institute of Mechanical Engineers (IMEchE) of United Kingdom. He won the Australian China Young Scientist Exchange Program award in 2009 and the Australian Japan Emerging Research Leader Program award in 2016 by the Australia Academy of Technological Sciences and Engineering (ATSE). He received “Dean’s Award” for outstanding research performance in 2016. He is Associate Editor of Australian Journal of Mechanical Engineering and editorial board member for five other international journals. He has completed many national/international research projects with a total value more than \$6 million. He is Co-CI of Blue Economic CRC (\$329 million). He has published more than 170 international journal and conference papers with a H-index of 28.

Course 2 & 3: Refrigeration /heat pump in sustainable building combined with renewable energy and design of refrigeration equipment

Date	Lecture & Seminar & Project Design with Defence	Time
2021/08	The Fundamentals Concepts of Thermodynamics	To be announced
	Heat Engine; Heat Pump; Refrigeration	
	Research project presentation and discussion (I)	
	Methods of Cooling and the Reversed Carnot Cycle	
	Rankine Cycle	
	Research project presentation and discussion (II)	
	A Vapour-Compression Refrigeration Cycle incorporating a throttle valve	
	Theoretical and Practical Cycle	
	Research project presentation and discussion (III)	
	A Single-stage vapour-compression refrigeration cycles with superheating and subcooling	
	Tutorial Session	
	Research project presentation and discussion (IV)	
	Multistage vapour-compression Refrigeration cycles water refrigeration	
	Tutorial Session	
	Research project presentation and discussion (V)	
	Absorption and gas cycle refrigeration	
	Heat Pump System (Fundamental concept)	
	Research project presentation and discussion (VI)	
	Renewable Energy and Heat Pump System	
	Renewable Energy Introduction	
Research project presentation and discussion (VII)		
Introduction to various types of heat pump		
Refrigeration system design		
Research project presentation and discussion (VIII)		
Project Design (Design of a Chiller or Uitary Air Conditioner)		
2021/08	<p>Project Defence/Presentation (each student will make 30 minute presentation for the project design). Marking will be evaluated based on: (1) presentation and layout; (2) pace and clarity; (3) Selection of material presented, results, critical analysis etc; (4) Level of technical competence demonstrated (including answering questions).</p>	

Course introduction

This module provides an introduction to several subject areas in refrigeration and heat pump system. The module develops student's knowledge of energy

management and efficiency. The topics covered in the module mainly include: Energy conversion technologies; Methods of cooling and the reversed Carnot cycle; Single-stage vapour-compression refrigeration cycle; Multistage vapour-compression refrigeration cycles; Heat pump system; Renewable energy and heat pump system. The module will also include visiting several real industries.

The module will be delivered through lectures and knowledge will be consolidated in seminar and problem solving sessions. Assessment will be an individual assignment.

英国赫特福德大学
Dr. Hongwei Wu



2004 年获北航工程热物理专业博士学位,由北航和香港科技大学联合培养,并获校优秀博士学位论文。2004-2007 年分别在加拿大英属哥伦比亚大学及阿尔伯塔大学从事传热与传质和多相流的博士后研究,2007 年回国直评为北航能源与动力工程学院副教授。2009 年至 2013 年分别在英国布鲁内大学和伯明翰大学进行科学研究。于 2013 年至 2015 年在英国西苏格兰大学任讲师,2015-2017 年在英国诺桑比亚大学机械工程系任高级讲师。吴宏伟博士的主要研究领域为新能源技术及能源的有效利用;环路热管,换热器及微通道的流动与换热;工业过程建模,仿真及控制;航空发动机热端部件的流动换热等,其担任英国国家自然科学基金评审专家,国际刊物 *Advances in Mechanical Engineering* 等编委,并已在国际知名期刊发表 SCI 论文 80 余篇

Dr Wu joined University of Hertfordshire as a Senior Lecturer in the School of Engineering and Computer Science since Jan. 2017. Dr Wu received his BEng (1st Class Honours, 1998), MSc (Distinction, 2000) and joint PhD (2004, with Hongkong University of Science and Technology) with specialisation in Thermofluids all from Beihang University (formerly Beijing University of Aeronautics and Astronautics). He has an academic/research profile previously developed at Northumbria University (Senior Lecturer, 2015-2017), University of the West of Scotland (Lecturer, 2013-2015), Birmingham University (Research Fellow, 2012-2013) and Brunel University London (Research Fellow, 2009-2012) in UK, Beihang University in China (Associate Professor, 2007-2009), as well as University of British Columbia & University of Alberta in Canada (Postdoc,

2004-2007). His research has been focused on Thermofluid Modelling/Simulation and experimental study for Energy & Flow Physics. He has an international profile with more than 120 peer-reviewed journal and conference publications in his academic career, including top journals such as Applied Energy, Applied Thermal Engineering, Fuel, International Journal of Heat and Mass Transfer etc. He has been a regular reviewer of many leading journals and serves as Editor/Editorial Board Members of several International Journals. He also serves as general Chair and session Chairs/co-Chairs, TPC members at a number of International Conferences. He is currently an EPSRC Peer Review Full College Member and regular reviewer for EPSRC proposals.

开课院系(Faculty)

东南大学能源与环境学院

School of Energy and Environment, Southeast University



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