



Beijing Institute of Technology
Future Decarbonizing Technology and Green Energy Program
1st July to 27th July, 2024
4 credits

NO.	Course	Teaching Hours	Course Description
1	Lecture 1 Energy Research Is Hot and Cool 热门及酷炫的能源研究	3	<p>The structure and technologies of energy systems are changing rapidly. Some of the reasons are: the mitigation of climate change; the rapid depletion of fossil fuels; the reduction of energy consumption so as to maintain a sustainable development. Renewable energies such as biomass, solar etc. have been vastly used, even in developing countries like China. This course aims to help students identify the major questions in the area of energy resources from volcano to deep ocean, and the fantastic energy technologies. The course commences with an overview of the main source of carbon emissions, energy production, followed by discussions of different scenarios for an energy mix. Such energy mix relies heavily on the deployment of renewable energy technologies such as biomass, geothermal, hydroelectric, solar, tidal, wave and wind.</p> <p>当前我们的能源系统的结构和技术正在发生翻天覆地的变化。为了减缓气候变暖、化石燃料的迅速枯竭、减少能源消耗以保持可持续发展，生物质能、太阳能等可再生能源已被全球包括中国这样的发展中国家中广泛使用。本课程旨在帮助学生认识从火山到深海等涉及到能源领域的主要问题，以及奇妙的能源利用技术。首先概述碳排放的主要来源、能源生产，然后讨论能源综合利用的不同情景。这种能源综合利用在很大程度上依赖于可再生能源技术，例如生物质能、地热能、水电、太阳能、潮汐能、波浪能和风能。</p>
2	Lecture 2 The Keys to a Sustainable Energy Future: Electric Vehicle and Energy Storage 实现可持续能源未来的关键：电动汽车与储能	3	<p>It has become a general trend for human society to shift from the current energy supply system dominated by fossil energy to an energy supply system dominated by renewable energy such as solar energy and wind energy. At present, new energy power generation technologies such as photovoltaics and wind power are relatively mature and have the conditions for large-scale promotion. However, new energy power generation is volatile, intermittent, and random, and must be combined with energy storage to serve as the main force of energy supply. Electric vehicles are developing rapidly around the world, and the power batteries carried by hundreds of millions of electric vehicles will become important energy storage facilities in the future. This lecture will introduce the important role that electric vehicles and energy storage technologies play in moving towards a world dominated by renewable energy.</p> <p>从目前以化石能源为主的能源供应体系向以太阳能、风能等可再生能源为主的能源供应体系转变，已成为人类社会的大势所趋。目前，光伏、风电等新能源发电技术相对成熟，具备大规模推广的条件。但新能源发电具有波动性、间歇性和随机性，必须与储能相结合才能成为能源供应的主力军。电动汽车在全球范围内发展迅速，数以亿计的电动汽车搭载的动力电池将成为未来重要的储能设施。本讲座将介绍电动汽车和储能技术在迈向可再生能源主导的世界中所发挥的重要作用。</p>
3	Lecture 3 Data Science for Harnessing the Wind 用数据科学实现驭风之术	3	<p>Wind energy, with its advantages of sustainability, cleanliness, wide accessibility and low environmental impact, has become the most dominant form of renewable energy in the world. However, due to wake effect, wind volatility, potential equipment failures and other factors, advanced research and improvement in various aspects are required to use wind power efficiently, including wind farm planning, operation, maintenance and control for wind turbines, etc. In this lecture, we will introduce the basic issues of concern in the field of wind power, and describe how the increasingly flourishing artificial intelligence technologies can help us solve these problems.</p> <p>风能由于其可持续性、清洁、广泛可获取性、对环境影响小等优点，成为了当前全世界最主流的一种可再生能源形式。然而，由于风的尾流效应、随机波动性、以及可能发生的设备故障等因素，需要在多个领域开展前沿的研究与提升，这些方面包括风电场的规划、以及风力发电机的运维与控制等等。在本节讲座中，我们将介绍风电领域中大家所关心的一些基本常见问题，并介绍如何使用正在蓬勃发展的人工智能技术来解决这些问题。</p>

4	<p>Lecture 4</p> <p>Introduction to the Hydrogen Energy Industry Chain and Prospects for Hydrogen Energy Application Technology 氢能产业链浅谈及氢能应用技术展望</p>	3	<p>Hydrogen energy is widely acknowledged as a highly promising clean energy sources in the 21st century. Hydrogen energy is very hot, while its characteristics of low density and easy combustion make it different from other forms of energy in production, storage, transportation and usage. This lecture will have a comprehensive overview of the technological progression pertaining to hydrogen energy, encompassing hydrogen production, storage, transportation, and related domains. Starting from the characteristics of hydrogen energy, the advantages and disadvantages of different application methods will be compared in detail. It will also introduce the application technologies of hydrogen energy and discuss the future direction of hydrogen energy technology development.</p> <p>氢能被视为21世纪最具发展潜力的清洁能源之一。虽然氢能源很热，但由于氢本身的低密度、易燃烧等特性使其制-储-运-用各个环节都与其他能源形式不同。本讲座将介绍氢能的整体技术发展链条，包括氢能源的制取、存储、应用等技术，从氢能源的特点出发，详细比较不同应用方式下的优缺点，还将介绍氢能的应用技术，讨论氢能技术发展的未来方向和路径。</p>
5	<p>Lecture 5</p> <p>Basic and high technology of solar energy application 太阳能应用基础与高新技术</p>	3	<p>It will introduce the basic concepts and basic knowledge of solar energy applications, including the basic knowledge of solar energy concentrating process and heat collecting process, involving thermal conversion and electrical conversion utilization. It will also introduce the latest technologies in the practical application of solar energy engineering, such as solar thermal power generation technology, solar PV power generation technology, solar hydrogen production technology and solar thermal storage technology, and discuss the future direction and path of solar energy development.</p> <p>将介绍太阳能应用的基本概念和基本知识，包括太阳能聚光过程和集热过程的基本知识，涉及到热转换和电转换利用。还将介绍太阳能实际应用工程中的最新技术，比如太阳能热发电技术、太阳能PV发电技术、太阳能制氢技术以及太阳能热储存技术等当前国际上的太阳能应用高新技术，讨论太阳能发展的未来方向和路径。</p>
6	<p>Lecture 6</p> <p>Advanced thermal energy storage technology and its application 先进热能储存技术及应用</p>	3	<p>It will introduce the basic concepts and basic knowledge of thermal energy storage technology, including the development and design of high-performance heat storage materials, efficient heat storage and exchange equipment, as well as the systems involved in heat transfer and conversion processes. It will also introduce the latest technologies for thermal energy storage in practical engineering applications, such as solar thermal power generation, building energy conservation, data center temperature control, cold chain supply, and electronic device thermal management, and discuss the future direction and path of thermal energy storage technology development.</p> <p>将介绍热能储存技术的基本概念和基本知识，包括热能传递与转换过程中涉及的高性能储热材料、高效储热换热设备和系统的研发设计。还讲介绍热能储存在实际应用中的最新技术，比如太阳能光热发电、建筑节能、数据机房温控、冷链供应和电子器件热管理等，讨论热能储存技术发展的未来方向和路径。</p>
7	<p>Laboratory Visit 实验室参访</p> <p>National Monitoring and Mangement for NEVS/BIT Museum 电动车国家大数据平台/ 北京理工大学校史馆</p>	3	<p>The Beijing institute of technology has compiled the national standard GB/T 32960 and built the "national monitoring and management platform for new energy vehicles".The platform has the capability of synchronous monitoring and management of millions of new energy vehicles,and can truly and reliably obtain the data related to "production, sales, purchase and service"of new energy vehicles, which provides data support for the technology and scientific research of new energy vehicles, industrial policy formulation, dynamic safety management, rational industrial layout and financial subsidies.</p> <p>新能源汽车国家监测与管理平台由北京理工大学建设并管理。平台具备百万辆级新能源汽车同步监控与管理能力，真实可靠地获得新能源汽车“产、售、购、役”等相关数据，为新能源汽车技术与科学研究、行业政策制定、动态安全管理、产业合理布局、财政补贴发放提供了数据支撑。</p>
8	<p>Factory Visit 企业参访</p> <p>BAIC BLUEPARK 企业参访-北汽新能源</p>	3	<p>Visit the BAIC New Energy Enterprise Exhibition Hall and static vehicle display, visit the BAIC New Energy Test Center, and exchange and discuss the current development status of the new energy industry. BAIC was founded in 2009, initiated and controlled by BAIC Group Co., Ltd., the Fortune 500 company, is the first independent operation and New energy vehicle enterprises with production qualifications in China.</p> <p>参观北汽新能源企业展厅及静态车展示，参观北汽新能源试验中心，围绕新能源产业发展现状进行交流座谈。北京新能源汽车股份有限公司（以下简称“北汽新能源”）创立于2009年，是由世界500强企业北京汽车集团有限公司发起并控股，是我国首家独立运营、首个获得新能源汽车生产资质的新能源汽车企业。</p>

9	<p style="text-align: center;">Factory Visit 企业参访</p> <p>JingHui Gas京辉气体 Hybustion氢燃科技</p>	3	<p>Jinghui Gas was established in 2012, integrating hydrogen production, storage, hydrogenation, and transportation, is one of the earliest enterprises in China to engage in hydrogen energy production and research and development, Hybustion is a disciplinary company established on the hydrogen internal combustion engine research team of Beijing Institute of Technology. The company inherits the existing achievements of the hydrogen internal combustion engine team in BIT, establishes a full chain of design and testing capabilities in the development of hydrogen internal combustion engine engineering prototypes and key components, engineering and product development, and gradually forms design technologies related to the hydrogen internal combustion engine industry chain.</p> <p>北京环宇京辉京城气体科技有限公司成立于2012年，京辉始创于1989年，集产氢、储氢、加氢、运氢为一体，是中国较早从事氢能生产与研发的企业，北京氢燃科技有限公司是依托北京理工大学氢内燃机研究团队组建的学科性公司，该公司继承北京理工大学氢内燃机团队的已有开发成果和经验，在氢内燃机工程样机及关键零部件研制、工程化与产品化开发等方面建立全链条的设计、检测能力，逐步形成氢内燃机产业链相关的设计技术、检测技术和标准体系。</p>
10	<p style="text-align: center;">Factory Visit 企业参访</p> <p>Great Wall Motor 企业参访-长城汽车</p>	6	<p>Visit Great Wall Motors Xushui Automatic Transmission Factory, Vehicle Production Park, and Haval Technology Center. GWM is a global intelligent technology company, whose business includes automobile and parts design, R&D, production, sales and service. Its brands include HAVAL, WEY, ORA, TANK and GWM Pickup. GWM has created an energy-intelligence-oriented forest ecosystem, established the parallel development of hybrid, pure electric, and hydrogen energy, and carried out the layout of the entire industry chain in terms of intelligent driving, intelligent cockpit, and intelligent chassis, and built an industry-leading. The leading energy system of "photovoltaic + distributed energy storage + centralized energy storage" has completed the full value chain layout of "solar energy-battery-hydrogen-vehicle power".</p> <p>参观长城汽车徐水自动变速器工厂、整车生产园区及哈弗技术中心。长城汽车是一家全球化智能科技公司，业务包括汽车及零部件设计、研发、生产、销售和服务，旗下拥有哈弗、魏牌、欧拉、坦克及长城皮卡。长城汽车打造了以能源、智能化为导向的森林生态体系，确立混动、纯电、氢能三轨并行发展，在智能驾驶、智能座舱、智慧底盘等方面进行全产业链布局，构建了业内领先的“光伏+分布式储能+集中式储能”的能源体系，完成了“太阳能-电池-氢能-车用动力”的全价值链布局。</p>
11	<p style="text-align: center;">Factory Visit 企业参访</p> <p>Beijing Jingqiao Thermal Power co., Ltd 北京京桥热电有限责任公司</p>	3	<p>Visit Beijing Jingqiao Thermal Power co., Ltd, a subsidiary of Beijing Energy Group Co., Ltd. Beijing Southwest Thermal Power Center, one of the four major gas thermal power centers in Beijing, belongs to the company. The company was established in 2003 and is located at 29 Caoqiao East Road, Fengtai District, Beijing, covering an area of 10.3 hectares. The total installed capacity includes four 116MW hot water boilers and one set of F-class gas steam combined cycle "two driven one" cogeneration unit. The installed capacity of power generation is 838MW, with a heating capacity of 1056MW and a heating area of 21 million square meters.</p> <p>北京京桥热电有限责任公司是北京能源集团有限责任公司下属企业，北京市四大燃气热电中心之一——北京西南热电中心。公司成立于2003年，位于北京市丰台区草桥东路29号，占地面积10.3公顷。总装机包括四台116MW热水锅炉和一套F级燃气蒸汽联合循环“二拖一”热电联产机组。发电装机容量838MW，供热能力为1056MW，供热面积2100万平方米。</p>
12	<p style="text-align: center;">Factory Visit 企业参访</p> <p>Baidu Autonomous Vehicle+Shougang Industrial Heritage Park 百度无人车体验+首钢工业遗址公园参观</p>	3	<p>Visit Apollo Park-π and Experience the Baidu autonomous vehicle and in Shougang Industrial Heritage Park. The Shougang Park is located in west Shijingshan District and is connected with the city center by the west extension of the Chang'an Avenue. It used to be the headquarter of Shougang Group, which was established in 1919 and a typical microcosm of 100-year industrial development process in China. The significant legacies of iron and steel manufacture, high-tech elements, modern vibes and the Winter Olympic venue, all make the Shougang Park is an attractive place for Nancy to visit. The Apollo Park π in Shougang Park embodies the concept of technological convenience, green and low-carbon living. By building an immersive space that integrates science popularization, experience and service, it showcases more possibilities brought by autonomous driving technology to life, leading the public to experience the charm of "future travel".</p> <p>在首钢工业遗址公园参观Apollo Park-π空间，体验百度无人车驾驶。首钢园位于石景山区，是长安金轴的西端。这里曾经是建立于1919年的首钢集团的总部所在，是中国工业发展历程的百年缩影，钢铁生产的壮观场面，科技元素、现代化气息、冬奥足迹遍布在这座老工业园区中。首钢园Apollo Park-π贯穿了科技便捷生活、绿色低碳的理念，通过搭建集科普、体验、服务于一体的沉浸式空间，展现了自动驾驶技术为生活带来的更多可能性，引领大众感受“未来出行”的魅力。</p>

13	Student Science and Innovation Team Exchange 学生科创团队交流	3	<p>The Beijing Institute of Technology (BIT) Formula SAE Team, the pioneering squad in China's University Student Formula Competition, has crafted 25 cars in 14 years. Notable models include the combustion engine "Black Shark," electric "Silver Shark," and autonomous "Gray Shark," all securing consecutive national championships. "Gray Shark" particularly boasts five titles in seven years.</p> <p>BIT Energy-saving Car Club, the longest-standing student organization in the School of Mechanical Engineering and Vehicle Engineering at BIT, holds a leading position in national university energy-saving car competitions. Established in 2012, BIT Solar Shuttle Solar Car Team has participated in numerous World Solar Challenge events, proudly representing the first mainland Chinese team in this prestigious global competition.</p> <p>北京理工大学方程式赛车队是中国大学生方程式赛车大赛的创始车队，14年来已研发制造了25辆赛车，燃油方程式赛车“黑鲨”、电动方程式赛车“银鲨”、无人驾驶方程式赛车“灰鲨”分别蝉联过相应组别的全国总冠军。其中“灰鲨”更是在七年比赛中斩获五座总冠军。北京理工大学节能车俱乐部作为机械与车辆学院乃至全校历史最悠久的科创类学生组织，俱乐部有良好的技术积淀，在国内大学生节能车领域一直处于顶尖水平。北京理工大学光梭太阳能车队成立于2012年，参加过多届世界太阳能车挑战赛，并且是该赛事第一支来自中国大陆的参赛队伍。</p>
14	Project Program 项目设计	6-9	<p>Divide the students into 5 teams based on their interest, with each team one topic. Students do the project and presentation under the teacher's guidance.</p> <p>按照学生意愿将学生分成5组，学生在老师指导下以小组为单位开展项目并完成成果展示。</p>
15	Chinese Language and Chinese Culture 汉语与中华文化体验	13-16	<p>The Chinese language course is designed for students learning Chinese from scratch. Through the teaching of Hanyu Pinyin, basic Chinese characters, and essential daily communication phrases, this course aims to develop the communicative skills of beginners. Simultaneously, it incorporates Chinese folklore experiences into the curriculum, allowing students to appreciate the allure of traditional culture. Additionally, it takes students beyond the campus to explore historic landmarks in Beijing, providing a diverse perspective on the fusion of traditional and modern China and offering a firsthand experience of the vibrant and colorful life in China.</p> <p>汉语课程主要面向零起点学生，通过汉语拼音、基础汉字以及基本日常交流用语的教学，培养零起点学习者运用汉语进行交际的能力；同时在汉语教学外融入中华民俗体验课程，感知传统文化的魅力；并带领学生走出校园，参访名胜古迹，多元感知中国传统与现代的结合，体验魅力多彩的中国生活。</p>