

Energy and Environmental Impact in 21st Century

Introduction

The rapid economic development of Asia and Middle East, especially the Association of Southeast Asian Nations (ASEAN) and India make their governments a great need on development of cutting-edge technology for various energy sources including fossil fuels, renewable energy, and nuclear power. However, the emission of pollutants from the use of fossil fuels and biofuel energy deteriorates the environmental quality in Asian regions. For example, the Southeast Asia region is subject to a very complex pollution scenario, especially in terms of air pollution and atmospheric chemistry, due to a large number and wide variety of emission sources and varying ambient conditions. Although most countries in ASEAN, India and Middle East produce petroleum and natural gas, these countries are still in shortage of electricity. Consequently, combustion of biomass releases an even larger amount of pollutants, especially the carbon dioxide. Due to the pressure of global warming and reduction of CO₂ emission, both Asian and Middle East countries gradually change the use of fossil fuel to low carbon and nuclear energies to reduce the emission of CO₂ and the cutting-edge technology for low carbon and renewable energies as well as the treatment technology for pollutants are urgently needed. During the past forty years, Taiwan has successfully changed from an agricultural society into an industrial society and has developed good systems for energy management and environmental protection. This “Taiwan experience” could be a model for ASEAN, India and Middle East countries during their transition stage.

The purpose of this joint-research and training program is to strengthen the academic and educational cooperation between Taiwan and Southeast Asian/Middle East counties, including Philippines, Indonesia, Malaysia, Thailand, Vietnam, India, and Jordan in the fields of energy and environment. An 8-day curriculum containing sustainable environment, low carbon energy, nuclear energy, and laboratory and field trip will be offered to 23 trainees from 7 countries. Through this training course, the trainees will learn knowledge in cutting-edge technology for low carbon and nuclear energies and sustainable environment.

Curriculum Planning

This training program, funded by the National Science Council, Taiwan, will mainly address the impact of fossil fuels on the global climate change and the development and application of low carbon green energy. The trainees will learn the comprehensive knowledge in world energy sources and distribution and current status of energy usage in

the world, especially the ASEAN, India and Middle East. The release of toxic chemicals from the combustion of fossil fuels and the impact of these toxic chemicals on global warming as well as human health will be described and discussed. In addition, the concept and application of low carbon and renewable energies including solar energy, hydrogen energy, and nuclear energy will also be introduced. After 32 hours of lecture courses, this program will arrange a 4-h field trip to visit North Visitors Center of Taiwan Power Company in Jin-Shan, New Taipei City, Taiwan. The detailed description of course contents is listed below:

Environmental Sustainability

The Southeast Asia region and Middle East are subject to a very complex pollution scenario, especially in terms of air pollution and atmospheric chemistry, due to a large number and wide variety of emission sources and varying ambient (e.g., meteorological) conditions. Specifically, the region has seen fast and large economic growth over the previous few decades, while environmental impacts were largely disregarded. Consequently, the urban areas, especially the string of cities situated along the coastlines (from southern China down to the Malay Peninsula), have been severely impacted by the multitude of anthropogenic emissions, such as from traffic, power generation, and industry. Aside from characterizing and quantifying the various emission source strength, it is of crucial importance to better understand the ambient chemical and physical processes, and the resulting pollution characteristics, so that better estimates regarding the environmental impact, especially on the regional climate and human health, can be done, as well as for the implementation of effective pollution mitigation plans.

Industrialization brought many benefits, but also pollution. Although nature has been polluted by almost all human activity, technological fixes are both necessary and possible. Nanotechnology has emerged as one of the most fascinating techniques in modern era and it can actually help solve some of environmental problems. Along with all these benefits, it is important to recognize that nanoparticles are a still relatively unknown area, and therefore their effects must be researched thoroughly as soon as possible.

Course Outline

Subject	Class Time	Subject Description
Climate Change and Environmental Pollution in Asia	4 hrs	The course will briefly introduce atmospheric structure and composition, the most important chemical reactions in the gas and aqueous phase, and the various types of air pollution. Specifically, a brief overview of urban photochemical smog will be given, as well as an introduction to the role of aerosol particles in the atmosphere, including their formation, transport, transformation and environmental

		effects. The influence of greenhouse gases and light-absorbing aerosols on global warming will be addressed in the context of global climate change, with an emphasis on anthropogenic influence.
Fate and transport of pollutants in the environment	2 hrs	This course will introduce the basic concepts of chemical mass and concentration, mass balance and the control volume, and chemical distribution among phases. The fundamental principles of mass transport, chemical partitioning, and chemical transformation in the environment will be discussed.
Nanotechnology in Environmental Sciences	2 hrs	The course will briefly introduce nanotechnology in environmental applications, including heavy metal detection, characterization and distribution of pollutants and their health effect.

Nuclear Energy

Under the pressure of global warming crises and greenhouse gas reduction, nuclear energy has been considered as an important option of low-carbon energy sources in some ASEAN countries and India. This part of the course will concentrate on nuclear energy, introducing basic principles of nuclear energy, the design and operation of nuclear power systems, the concept of safety/risk analysis of nuclear reactors, radiation safety and selected health physics topics, and also the Fukushima Daiichi nuclear accident and its impact on future development of nuclear energy. The design of this eight-hour course aims to provide an overview for the use of nuclear energy and to strengthen the students the basic concepts of nuclear power generation and its safety. The overall curriculum design and outline for the eight-hour course is as follows:

Course Outline

Subject	Class Time	Subject Description
Deployment of Nuclear Power in Taiwan	2 hrs	Offer introductory material on nuclear engineering including the importance of nuclear energy, fission chain reaction, principles of nuclear reactors, and deployment of nuclear power in Taiwan.
Nuclear Power Systems	2 hrs	Introduce the design and operation of nuclear power systems including the following topics: general thermodynamics considerations, main components of nuclear power plants, nuclear fuel cycles, and safety analysis of nuclear reactors
Health Physics	2 hrs	Describe interactions of ionizing radiation with matter, natural background, industrial and medical applications of

		radiation, radiation detection and measurement, dosimetry, radiation shielding and protection
Fukushima Daiichi Nuclear Disaster	2 hrs	Explain the Fukushima Daiichi nuclear accident - Lessons learned and its impact on future development of nuclear energy

Green Energy

This series of courses focuses on introduction to green energy technologies. In addition to a comprehensive coverage on low-carbon and renewable energy sources, special emphases will be given to applications and principles of hydrogen energy and solar energy. In the meantime, novel technologies for energy storage and conversion will also be discussed. A total of 16 hours is allocated for this series of courses, which are categorized into the following five areas. The overall curriculum design and outline for the sixteen-hour course is as follows:

Course Outline

Subject	Class Time	Subject Description
Overview of Low Carbon Energy	2 hrs	Briefly introduction to the low carbon energies. The socioeconomic impact of clean energy as well as the energy management will be discussed.
Solar Cells	4 hrs	Describe principle of solar cell and application of different types of solar cells.
Hydrogen Energy and Fuel Cells	4 hrs	Explain the fundamental properties of hydrogen, describe the working principles of fuel cells, and introduce various fuel cells.
Energy storage	3 hrs	Describe the principles of energy storage and the devices of Li-ion battery and supercapacitors.
Thermal Management	3 hrs	Describe the principles of thermal management and the devices for electronics cooling and magnetic refrigeration.

Technical Tour

North Visitors Center of Taiwan Power Company:

The North Visitors Center of Taiwan Power Company was established by Taiwan Power Company for several purposes, including (i) the enhancement of community understanding of nuclear energy, (ii) the promotion of the use of nuclear power, and (iii) the demonstration of the operation and safety of nuclear power plants. The Center offers plenty of exhibitions about nuclear energy and radiation safety including principles of nuclear energy, various methods of generating

electricity, safety and environmental concerns and protection measures. There is a half-scale reactor model showing visitors the operation of boiling water reactors. Many graphic demonstrations and animations are provided to introduce the structure of power plants, the management and disposal of nuclear waste, the use of nuclear power around the world and future development of nuclear energy. Through this technical tour, we believe the trainees will have a clearer picture about nuclear energy and its safety.



College of Nuclear Science, National Tsing Hua University

Course Timetable

	8/27 (Mon)	8/28 (Tue)	8/29 (Wed)	8/30(Thu)	8/31(Fri)	9/01(Sat)	9/02	9/03(Mon)	
08:20	09:00 Opening Ceremony	Overview of Low Carbon Energy Prof. Chin Pan	Health Physics Prof. Rong-Jiun Sheu	Hydrogen Energy Prof. Pen-Cheng Wang	Energy Storage II Prof. Chih-Hao Lee Basic Heat Dissipation Design Prof. Wei-Keng Lin	Visit NPP2 of Taiwan Power Company		Revisiting the Fukushima Daiichi Nuclear Accident Prof. Tsung-Kuang Yeh	
10:20									
Break									
10:30	Climate Changes and Precipitation Extremes Prof. Shaw-Chen Liu	Deployment of Nuclear Power in Taiwan Prof. Min Lee	Solar Cells I Prof. Yung-Chun Wu	Fuel Cells Prof. Kan-Lin Hsueh	Room Temperature Magnetic Refrigeration Prof. Yu-Chuan Su				Nanotechnology in Environmental Sciences Prof. Yuh-Jeen Huang Prof. Yu-Fen Huang
12:30									
Lunch									
14:00	Impact of Biomass Burning in SE Asia on Regional Environment and Climate Prof. Neng-Huei Lin	Nuclear Power Systems Prof. ChunKuan Shih	Solar Cells II Dr. Hsin-Fang Lee	Energy Storage I Prof. Chih-Hao Lee	Fate and Transport of Pollutants in the Environment Prof. Chien-Hou Wu			14:00 Closing Ceremony	
16:00									
16:10	Campus tour								

Application

■ Qualification

Candidates should be, but not limited to, postgraduates, lectures, faculties, or researchers who are highly interest in learning environmental science and low carbon energy. No previous experience in environmental and/or energy science and technology is necessary.

■ Selection

The training program is limited to 23 trainees from Philippines, Indonesia, Malaysia, Thailand, Vietnam, India, and Jordan. Application with master degree is preferred.

■ Award details

The fellowships would include all tuition, transportation (round-trip air flight ticket), housing, foods, and field trip.

■ More information about this training program can be found here:

<http://www.nthu-nuclEEI.org.tw/>

※[The website will open after July 15th, 2012](#)

Reception Information

■ Reimbursement for overseas transportation expenses

We offer every participant a subsidy for purchasing economy class round trip tickets directly from home country to Taiwan.

■ Airport Pick-up

Airport pick-up will be arranged according to every participant's flight schedule.

■ Accommodation

Two participants share one room with two single beds. Each room is equipped with TV and wireless internet.

■ Meals

Breakfast, lunch and dinner are all included. If you have any special dietary requirement, please inform us in advance.

■ Handout and 4G USB

Contact Us

For further information or questions, please contact the College of Nuclear Science, National Tsing Hua University, Taiwan

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- E-Mail: nuclear@my.nthu.edu.tw
- <http://www.nucl.nthu.edu.tw>

Application Form

PERSONAL INFORMATION			
First Name		Middle Name	
Family Name			
Date of Birth	(DD-MM-YYYY)	Gender	<input type="radio"/> Male <input type="radio"/> Female
E-mail address			
Contact Phone			
Contact Address			
English proficiency	<input type="radio"/> Fluent	<input type="radio"/> Good	<input type="radio"/> Fair <input type="radio"/> Poor
NATIONALITY AND RESIDENCE			
Country of Residence			
Passport No.		Place of Issue	
Date of Issue	(DD-MM-YYYY)	Date of Expiry	(DD-MM-YYYY)
Please attach a scanned copy of your passport (ID Page) (JPEG image or PDF file)			
EDUCATION BACKGROUND			
Affiliation (Institute/ University/Company)			
Current Position			
Highest Degree			
Majoring Field			
Please attach scanned copies of reference documents including, 1. A photocopy of your highest education diploma (JPEG image or PDF file) 2. A photocopy of your student ID or employment certificate (JPEG image or PDF file)			

EMERGENCY CONTACT	
Full Name	
Relationship to You	
Contact Phone	
Contact Address	
Email	
<p>DECLARATION</p> <p>I certify that the information I have provided in this application is complete and correct. I understand that any misrepresentation, omission, or submission of false information is grounds for rejection of my application, withdrawal of acceptance, cancellation of enrollment, and/or disciplinary action at a future date. If my application is accepted, I agree to abide by the policies, rules, and regulations of the Republic of China and National Tsing Hua University.</p> <p>Applicant's signature _____ Date _____</p>	

※ All required documents need to be completed and received by College of Nuclear Science through email by July 21st, 2012. We will give you a confirmation letter after receiving complete documents.

Contact Information :

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National Tsing Hua University

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