Department of Environmental Engineering and Management
College of Science and Engineering

Chaoyang University of Technology
INTRODUCTION

The Department of Environmental Engineering and Management, Chaoyang University of Technology offers leading edge research and education program that prepares engineers and scientists for the technological challenges of the 21st century. The Department, capitalizing on its unique interdisciplinary focus, provides students with the knowledge of environmental engineering and management fundamentals, and an understanding of economic, environmental and societal issues that influence intelligent technology choices. The Department offers the degrees in the Bachelor and Master in Environmental Engineering and Management. In addition to teaching and research, the Department renders professional services in environmental engineering and management. Perspective clients can arrange their service needs through the Environmental Engineering and Management Professional Service Center of the Department.

The Department has several modern laboratories for teaching and research. These laboratories include an Environmental System Analysis Laboratory, an Environmental Quality Analysis Laboratory, an Analytical Chemistry Laboratory, a Biotechnology Laboratory, a Waste Recycling Technology Laboratory, and a Soil Environmental Science Laboratory.

COURSE OF STUDY

The Environmental Engineering and Management curriculum for undergraduate students focuses on economic analysis and environmental information application, environmental engineering and management. Teaching staffs place premium on the hands-on experience that enables students becoming operational. In the graduate program, a student can, based on his/her interests and prior training, choose to concentrate on environmental management or environmental engineering. The students must write a thesis to fulfill the graduation requirement.

RESEARCH FACILITIES

There are complete research facilities in this Department. Using the facilities, the faculties can conduct the research regarding environmental system analysis, environmental quality assay, and developing capability of environmental management. In addition, the research scope can be extended to corporate with the industries, government, and academic institutes. The associated laboratories are as follows:

- Environmental Laboratory
- Environmental Microanalysis Laboratory
- Water Quality Control and Monitoring Laboratory
- Soil and Groundwater Laboratory
- Air Pollution and Toxicant Laboratory
- Waste Resource Recycling Laboratory
- Environmental Pilot Plant Laboratory
- Environmental Biotechnology Laboratory
<table>
<thead>
<tr>
<th>Name</th>
<th>Professional title</th>
<th>Educational</th>
<th>Research areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min-Chao Wang</td>
<td>Professor and Chair</td>
<td>Ph.D., Univ. of Saskatchewan, Canada</td>
<td>Soil physical chemistry, environmental chemistry</td>
</tr>
<tr>
<td>Jeremy M.H. Liu</td>
<td>Associate professor</td>
<td>Ph.D., Environmental Engineering, University of Missouri-Columbia</td>
<td>Soil and groundwater investigation and remediation, solid waste and hazardous waste treatment and disposal, air pollution control</td>
</tr>
<tr>
<td>Hsi-Hsien Yang</td>
<td>Associate professor</td>
<td>Ph.D., National Cheng Kung University</td>
<td>Atmospheric air pollution, aerosol, mobile source emission</td>
</tr>
<tr>
<td>Sheng-Lung Lin</td>
<td>Assistant professor</td>
<td>Ph.D., Georgia Institute of Technology</td>
<td>Environmental management, green building</td>
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<tr>
<td>Shun-Hsing Chuang</td>
<td>Assistant professor</td>
<td>Ph.D., Environmental Engineering, National Central University</td>
<td>Environment biotechnology, wastewater treatment, water reclamation and reuse</td>
</tr>
<tr>
<td>Shu-Fen Cheng</td>
<td>Assistant professor</td>
<td>Ph.D., Graduate Institute of Environmental Engineering, National Taiwan University</td>
<td>Soil and groundwater remediation, healthy risk assessment, hazardous waste treatment, industrial wastewater treatment</td>
</tr>
<tr>
<td>Jih-Hsing Chang</td>
<td>Assistant professor</td>
<td>Ph.D., Department of Civil and Environmental Engineering at University of Delaware</td>
<td>Environmental physics and chemistry, physical and chemical remediation techniques for contaminated soils, treatment of hazardous materials</td>
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<tr>
<td>Ho-Wen Chen</td>
<td>Assistant professor</td>
<td>Ph.D., National Cheng Kung University</td>
<td>Watershed management, information and system engineering, soft computing</td>
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<tr>
<td>Hung-Yueh Lin</td>
<td>Assistant professor</td>
<td>Ph.D., Institute of Environmental Engineering, National Chiao Tung University</td>
<td>Environmental system analysis, waste management</td>
</tr>
<tr>
<td>Tzu-Yi Pai</td>
<td>Assistant professor</td>
<td>Ph.D., Environmental Engineering Institute, National Central University</td>
<td>Environmental mathematical modeling, wastewater treatment, sewer engineering, solid waste management and resource technology</td>
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<tr>
<td>Dyi-Huey Chang</td>
<td>Assistant professor</td>
<td>Master, Civil and Environmental</td>
<td>Artificial neural networks in remote sensing of hydrologic</td>
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<tr>
<td>Huang-Mu Lo</td>
<td>Assistant professor</td>
<td>Ph. D., Department of Civil and Environmental Engineering University of Southampton, United Kingdom Ph. D., Department of Soil and Water Conservation, National Chung-Hsing University, Taiwan, R.O.C.</td>
<td>Environmental engineering and management, Soil and water conservation</td>
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Total hour-credit for a semester:
- University required: 18 courses, 30 credits
- Professional required: 22 courses, 58 credits
- Professional selective: 33 courses, 95 credits, minimum selective of 34 credits
- Credit of free selective: 6 credits
- Minimum graduation credit: 128 credits
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- **Professional selective** 36 courses 92 credits, minimum of 26 credits
- **Credit of free selective** 0
- **Minimum graduation credit** 36 credits including 6 credits for master thesis
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<td>35 courses 87 credits, minimum selective of 27 credits</td>
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<td>36 credits including 6 credits for master thesis</td>
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# MASTER'S UNITS OF STUDY-ENVIRONMENTAL ENGINEERING AND MANAGEMENT

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## UNIT OF STUDY DESCRIPTIONS

**EME1107, EME1202, EME2102, EME2201** Seminar(1)–(4)-1 credit

**Class:** Lectures-2 hours/week (36 hours) in each semester, in 2 years.

**Assessment:** Reading report and presentation.

**Objectives:** This course emphasizes the training of students' ability to search and synthesize the existing knowledge regarding environmental engineering and management, along with the postal and/or oral presentation of the synthesized knowledge.

**Outcomes:** Students will develop the ability to search, screen, and synthesize the existing knowledge and its presentations.

**Syllabus summary:** This course is focused on the training of students ability in searching and synthesizing existing knowledge as well as the skill of students’ postal and oral presentations.

**Reference materials:** Designated journal references and associated materials.

**EME1159, EME1269, EME2161, EME2256** Special Topics in Environmental Monitoring(1)–(4)-2 credits of each
Class: Report and discussion-2 hours/week (36 hours) in each semester, in 2 years.

Assessment: Literature review, report preparation, and topic presentation.

Objectives: This course emphasizes to aid students progressively conducting theses experimental along with the discussion of obtained results with advisor in a group of the same field.

Outcomes: Students will progress their thesis experimental stepwise through each stage of course planning.

Syllabus summary: This course is focused on the students’ report and the discussion between students and advisors of the same field in a group meeting. Mutual discussion and pieces of advice from the advisors do reinforce to improve the integration of the significance of students’ theses experimental results.

Reference materials: Designated journal references and associated materials.

EME1162, EME1264, EME2164, EME2258 Special Topics in Environmental Management (1)~(4)-8 credits

Class: Lectures-2 hours/week (36 hours) in each semester, in 2 years

Assessment: Discussion of recent research papers on the topics of environmental management and presentation.

Objectives: This course helps students to develop the ability of system analysis in research topics. With panel/individual discussion, writing and presentation, students will improve their skills in methodology and independent thinking.

Outcomes: Students will develop the ability to solve the environmental problems in the view of environmental system analysts.

Syllabus summary: This course focuses
on the training of students’ preparation in their dissertation in environmental system analysis field.

**Reference materials:** Designated journal references and associated materials.

**EME1161, Environmental Thermodynamics and Kinetics - 3 credits**

**Class:** Lectures-3 hours/week (54 hours) in each semester,

**Assessment:** Homework and presentation.

**Objectives:** This course help students to understand the knowledge of classical thermodynamics (laws and equilibrium), multicomponent equilibrium (nonideal solution, fugacity), thermodynamics in environment (air-water and soil-water), and kinetics in environment (kinetics laws, catalysis, redox reactions).

**Outcomes:** Students will develop the scientific skills to apply thermodynamics knowledge to interpret and solve the environmental problems.

**Syllabus summary:** This course focuses on intruding the fundamental thermodynamics and kinetics knowledge to graduate students for describing the environmental problems in a chemical viewpoint.

**Reference materials:** Elements of Environmental Engineering, Thermodynamics and Kinetics, Kalliat T. Valsaraj.

**EME1164 Remote Sensing of the Environment - 3 credits**

**Class Lectures:**-3 hours/hr (54 hours) in a semester

**Assessment:** Reading report and computer-based practices.

**Objectives:** The main objectives of this course is to introduce remote sensing (RS) as an important enabling tool for earth-surface research problems and applications, to examine the basics of RS and the main sensor systems that are in use, and to provide practical experiences of image processing and interpretation.

**Outcomes:** Students will develop the ability to apply RS as a tool in various sciences.

**Syllabus summary:** Remote sensing (RS) involves measurement of electromagnetic radiation from the earth’s surface to produce digital images. With knowledge of how such images are collected and processed it is possible to use them in a range of geographical applications, including environmental assessment and monitoring, geological and land cover mapping, hydrology and climatology.

**Reference materials:** Designated journal references and associated materials.

**EME1252 Advance in Solid Waste Treatment - 3 credits**

**Class:** Lectures - 3 hours/week (54 hours in a semester)

**Assessment:** Examinations and quizzes, literature review, report preparation, and topics presentation.

**Objectives:** This course will introduce the solid waste management to the students, and discuss the waste treatment technology and disposal method.

**Outcomes:** Students will develop the concept and skill for solid waste and
hazardous waste management. In addition, the students will improve the literature reading and report writing skills.

**Syllabus summary:** The subjects of this course will include the definition of solid waste, waste treatment and disposal regulation, waste source and property, collection and transportation, pretreatment (resource recovery), storage and treatment, incineration, landfill, solidification, biotreatment, hazardous waste management, hazardous material spill control technology.

**Reference materials:**

**EMF1252 Environmental Economics and Policy-3 credits**

**Class:** Lecture-3 hours/wk (54 hours for the semester)

**Assessment:** Mid-term 20% and term paper 80%

**Objectives:** To explain quantitatively the relation between economics activity and environment and the modeling of environmental pollution control.

**Outcomes:** Students will develop the ability to perform environmental policy analysis with respect to economics issues

**Syllabus summary:** Major substance includes sustainability principals, rationale of policy instruments, and information asymmetry problems.

**Reference Materials:**
1. Environmental and Natural Resource economics, T. Tietenberg, 6th edit.

**EME1254 Design for Environment - 3 credits**

**Class:** Lectures-3 hours/week (48 hours)

**Assessment:** Exams, projects, and term papers.

**Objectives:** Design for environment (DFE) is a concept whose time has come. It is not the product of shrill environmental extremists demanding that industrial be frozen, nor does it originate in the sentimental fantasies of nature-lovers. It is a deliberate, thoughtful, and mature effort by both government and industry to acknowledge the importance of environmental preservation while supporting industrial growth. This course is to affirm the legitimacy of DFE as both a management approach and an engineering discipline.

**Outcomes:** Students will develop the ability to design and evaluate green products.

**Syllabus summary:** This course is focused on the development the practical design metrics, guidelines, and verification methods. It also deploys an integrated system framework to provide useful guidance for decision-making during fast-cycle product development and a useful point of reference for those who adopt the practice of DFE.
Reference materials:  

EME2153, Environmental Decision Analysis -3 credits

Class: Lectures-3 hours/week (54 hours) in a semester,

Assessment: Exams and term projects.

Objectives: This course helps students to understand the theorems of linear programming, integer programming, network programming, and nonlinear programming. And learn to apply the theorems in environmental problems.

Outcomes: Students will develop the ability and skill to apply decision making tools to simulate, solve, and analyze the environmental problems.

Syllabus summary: This course focuses on introducing tools in decision making and the applications of environmental engineering and management.

Reference materials:  

EME2162, Water Resource Management -3 credits

Class: Lectures-3 hours/week (54 hours) in each semester,

Assessment: Exams and term projects

Objectives: This course introduces the methodologies for water resources management and water pollution control from the viewpoint of environmental system.

Outcomes: Students will establish the basic knowledge in environmental biotechnology as well as the ability of research on biological topics.

Syllabus summary: The subjects include basics of microbiology, molecular biology and microbial kinetics, molecular biotechnology, nutrient removal and bioremediation.

Reference materials: Designated journal references and associated
EME1261 Environmental Monitoring-3 credits

Class: Lectures-3 hours/week (54 hours) in a semester

Assessment: Lecture and presentation.

Objectives: The course introduces the principles and applications of environmental monitoring. The measurement of groundwater, soil, surface water, air and noise pollution should be learned.

Outcomes: Students will learn the principles and applications of environmental monitoring, including groundwater, soil, surface water, air and noise pollution measurement.

Syllabus summary: The monitoring of groundwater, soil, surface water, air and noise pollution, and data analysis are explained by six professors.

Reference materials: Standard method of NIEA, Taiwan.

RESEARCH GRANTS CONDUCTED AND BEING CONDUCTED

Min-Chao Wang, Professor and Chairman

Title of Research Grant:
Effect of Evapotranspiration on the Uptake of Heavy Metals by Crops
Conducting Period: 2001/8 ~ 2003/8
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant:
Studies on the Indexes of Physical and Chemical Properties of Soil Quality in Soil Ecosystem
Conducting Period: 2001/8 ~ present
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant:
Effect of Long-term Agricultural Wastewater Applied to Soils on the Regime of Heavy Metals in Soil Environment
Conducting Period: 2001/1 ~ 2003/12
Organization of Financial Support: Council of Agriculture, Taiwan ROC

Title of Research Grant:
Integrated Management Planning for the Techi Reservoir Watershed
Conducting Period: 1997/1 ~ present

Title of Research Grant:
Investigation and Site Management of Heavy Metals in Agricultural Land
Conducting Period: 2002/1 ~ 2002/12
Organization of Financial Support: Environmental Protection Administration, Taiwan ROC

Title of Research Grant:
Effect of the Application of Byproduct Lime to Soil on Soil Reclamation and Plant Growth

Conducting Period:
2002/8 ~ present

Organization of Financial Support:
Taiplastic Petrochemical Co.

Jeremy Min-Hsin Liu, Associate Professor

Title of Research Grant:
Natural Attenuation Study of Chlorinated Solvents in Ground Water

Conducting Period:
2003/1 ~ 2003/10

Organization of Financial Support:
Chaoyang University of Technology, Taiwan ROC

His-Hsien Yang, Associate Professor

Title of Research Grant:
Investigation of Size Distributions and Dry Depositions of Metal Elements and Ions in Marine Aerosol

Conducting Period:
2000/8 ~ 2001/7

Organization of Financial Support:
National Science Council, Taiwan ROC

Title of Research Grant Effect
Application of Vacuum-deposited Thin Film Method for the Investigation of Marine Aerosol by Single Particle Approach

Conducting Period:
2001/8 ~ 2002/7

Organization of Financial Support:
National Science Council, Taiwan ROC

Title of Research Grant:
Investigation of the Pretreatment of Vacuum-deposited Thin Film Method for Nitrate Particulate

Conducting Period:
2001/7 ~ 2002/2

Organization of Financial Support:
National Science Council, Taiwan ROC

Title of Research Grant:
Measurement of PAH Dry and Wet Deposition in the Surrounding of Municipal Solid Waste Incinerator

Conducting Period:
2001/7 ~ 2002/6

Organization of Financial Support:
Kuen-Ting Entech Co., Ltd.

Title of Research Grant:
Investigation of Emission Sources and Mechanisms for Sand Storm

Conducting Period:
2000/8 ~ 2001/12

Organization of Financial Support:
Mongolian & Tibetan Affairs Commission

Title of Research Grant:
Measurement of PAH Concentration in the Ambient air of Municipal Solid Waste Incinerator

Conducting Period:
2001/8 ~ 2002/5

Organization of Financial Support:
Title of Research Grant: Developing and Application of Single Particle Approach to Investigate the Characteristics of Particulate Sulfate Dry Deposition
Conducting Period: 2002/8 ~ 2003/7
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: Characteristics of Polycyclic Aromatic Hydrocarbons in Indoor Air with Essential Oil
Conducting Period: 2002/7 ~ 2003/2
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: Investigation of the Effects of Aromatic Composition and Content on Diesel Engine Emissions
Conducting Period: 2003/8 ~ 2004/7
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: Investigation of the Effects of Fuel Property Improvement on Air Pollutant Emission from Motorcycle and the Establishment of Emission Factors
Conducting Period: 2003/4 ~ 2003/12
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: On Using LCA to Develop the Environmental Accounting System in Taiwanese Industry
Conducting Period: 2001/7 ~ 2003/8
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: The Development of Energy Assessment Technology for the Building
Conducting Period: 2001/9 ~ 2002/12
Organization of Financial Support: National Science Council, Taiwan ROC

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Sheng-Lung Lin, Assistant Professor

Title of Research Grant: The Study of Simultaneous Nitrogen and Phosphorus Removed in Membrane Bioreactor
Conducting Period: 2003/8 ~ 2004/7
Organization of Financial Support: National Science Council, Taiwan ROC

Shun-hsing Chuang, Assistant Professor

Title of Research Grant: Anaerobic-aerobic Membrane Bioreactor for Nutrient Remove
Conducting Period: 2004/8 ~ 2005/7
Organization of Financial Support: National Science Council, Taiwan ROC

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Title of Research Grant: The Observation of Membrane Surface of MBR by SEM
Conducting Period: 2004/4 ~ 2004/11
Organization of Financial Support: IRI

Shu-Fen Cheng, Assistant Professor

Title of Research Grant: The Feasibility Studies of the Remediation Techniques for the Heavy Metals Contaminated Soil
Conducting Period: 2003/8 ~ 2004/7
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: The Research of the Removal Mechanisms and Applications of the System That Combination of the Zero-valent Metal and Electro-chemistry Reaction
Conducting Period: 2003/8 ~ 2004/7
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: The Study of Enhancement Mechanism and Application on the Reduction Power of Zero-valent Metals by Metal Catalysts
Conducting Period: 2002/8 ~ 2003/7
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: The Research of the Best Application and Operation Conditions for the Electrocoagulation Technique on the Industrial Wastewater Treatment
Conducting Period: 2002/8 ~ 2003/7
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: Zero-valent Metal Remediation Technology for Nitrate-contaminated Groundwater
Conducting Period: 2001/8 ~ 2002/7
Organization of Financial Support: National Science Council, Taiwan ROC

Jih-Hsing Chang, Assistant Professor

Title of Research Grant: Integration of Ultrasonic and Electrokinetics to Recover Heavy Metals from Contaminated Soils-Exemplified with Copper
Conducting Period: 2003/8~2004/7
Organization of Financial Support: National Science Council, Taiwan ROC

Title of Research Grant: The Study on Chitin Materials for the Adsorption Characteristics and
Operational Parameters with Organic Contaminants

**Conducting Period:**
2003/6~2004/5

**Organization of Financial Support:**
National Science Council, Taiwan ROC

**Title of Research Grant:**
Physicochemical Mechanisms and System Simulation of Cleaning Organic Contaminated Soils by electrokinetiсs(II)

**Conducting Period:**
2002/8~2003/7

**Organization of Financial Support:**
National Science Council, Taiwan ROC

**Title of Research Grant:**
The Integration Technique of Zero-valent Metal and Electrokinetiсs to Remediate Organic Contaminated Soils and Groundwater

**Conducting Period:**
2002/6~2003/5

**Organization of Financial Support:**
National Science Council, Taiwan ROC

**Title of Research Grant:**
Physicochemical Mechanisms and System Simulation of Cleaning Organic Contaminated Soils by Electrokine

**Conducting Period:**
2001/08~2002/07

**Organization of Financial Support:**
National Science Council, Taiwan ROC

**Hung-Yueh Lin, Assistant Professor**

**Title of Research Grant:**
Remote Sensing and Risk Analysis Assisted Model for Urban Landfill Siting

**Conducting Period:**
2002/8~2003/7

**Organization of Financial Support:**
National Science Council, Taiwan ROC

**Title of Research Grant:**
Artificial Neural Network Assisted Tools for Landfill Sites Risk Analysis

**Conducting Period:**
2003/8~2004/7

**Organization of Financial Support:**
National Science Council, Taiwan ROC

**Tzu-Yi Pai, Assistant Professor**

**Title of Research Grant:**
A Study to Quantify the Active Biomass and Components in Sewer/wastewater Treatment Plant/River Systems with OUR, NUR and AUR

**Conducting Period:**
2002/1 ~ 2002/7

**Organization of Financial Support:**
National Science Council, Taiwan ROC

**Title of Research Grant:**
Evaluation of Bulking Potential in the Biological Nutrient Removal Activated Sludge Process

**Conducting Period:**
2003/8 ~ 2004/7

**Organization of Financial Support:**
National Science Council, Taiwan ROC
Hanug-Mu Lo, Assistant Professor

**Title of Research Grant:**
Biostabilization of MSW Co-digested with MSWI Fly Ash

**Conducting Period:**
2004/1 ~ 2004/11

**Organization of Financial Support**
Chaoyang University of Technology, Taiwan ROC

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Ho-Wen Chen, Assistant Professor

**Title of Research Grant:**
The Application of Environmental System Analysis to Water-land Resources Management in River Basin

**Conducting Period:**
2002/8 ~ 2003/7

**Organization of Financial Support:**
National Science Council, Taiwan ROC

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**Title of Research Grant:**
The Planning and Establishment for Environmental Data Quality System

**Conducting Period:**
2002/1 ~ 2002/12

**Organization of Financial Support:**
Environmental Protection Administration, Taiwan ROC

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**Title of Research Grant:**
The Development of Grey System Dynamic Model to Water Resource Management

**Conducting Period:**
2003/8 ~ 2004/7

**Organization of Financial Support:**