國立臺北大學自然資源與環境管理研究所

112 學年度第一學期『環境工程科學概論』

課程講義(01)：環境工程科學簡介

- COURSE INTRODUCTION
  - □ Handouts
  - □ Homework, Midterm Exam, and Final Reports
  - □ Textbook and References
- ENVIRONMENTAL ENGINEERING SCIENCE
  - □ https://en.wikipedia.org/wiki/Environmental_engineering_science
    Environmental engineering science (EES) is a multidisciplinary field of engineering science that combines the biological, chemical and physical sciences with the field of engineering. This major traditionally requires the student to take basic engineering classes in fields such as thermodynamics, advanced math, computer modeling and simulation and technical classes in subjects such as statics, mechanics, hydrology, and fluid dynamics.
  - □ Description at Universities
    ⇒Stanford University:
    The Civil and Environmental Engineering department at Stanford University provides the following description for their program in Environmental Engineering and Science: The Environmental Engineering and Science (EES) program focuses on the chemical and biological processes involved in water quality engineering, water and air pollution, remediation and hazardous substance control, human exposure to pollutants, environmental biotechnology, and environmental protection.
    ⇒UC Berkeley:
    The College of Engineering at UC Berkeley defines Environmental Engineering Science, including the following: This is a multidisciplinary field requiring an integration of physical, chemical and biological principles with engineering analysis for environmental protection and restoration. The program incorporates courses from many departments on campus to create a discipline that is rigorously based in science and engineering, while addressing a wide variety of environmental issues. Although an environmental engineering option exists within the civil engineering major, the engineering science curriculum provides a more broadly based foundation in the sciences than is possible in civil engineering.
    ⇒Harvard University:
    Environmental Science and Engineering at Harvard School of Engineering is an interdisciplinary program with the common goal of understanding, predicting and responding to human-induced environmental change. Addressing environmental issues such as global warming, stratospheric ozone depletion, or local and regional air and water pollution requires perspectives from a diverse set of scientific disciplines including atmospheric physics and chemistry, oceanography, glaciology, hydrology, geophysics, ecology, and biogeochemistry.
  - □ Sciences and Engineering => Natural Sciences and Mostly Quantitative Approaches
  - □ Environmental Protection => Environmental Change => Climate Change
  - □ Natural Resource Depletion and Environmental Quality Degradation
  - □ Sustainable Development => Sustainability => Sustainable Engineering

- TOPICS COVERED IN MAJOR REFERENCES
  - □ Masters, G. M. and W. P. Ela (2008)
    Introduction to Environmental Engineering and Science, 3rd Edition
    1. Mass and Energy Transfer.
    2. Environmental Chemistry.
    3. Mathematics for Growth.
    4. Risk Assessment.
    5. Water Pollution.
    6. Water Quality Control.
    7. Air Pollution.
    8. Global Atmospheric Change.
    9. Solid Waste Management and Resource Recovery.
    Useful Conversion Factors.

  - □ Davis, M. L. and D. A. Cornwell (2022)
    Introduction to Environmental Engineering, 6th Edition
    1 Introduction
    2 Materials and Energy Balances
    3 Risk Assessment
    4 Water Resources Engineering
    5 Water Chemistry
    6 Water Treatment
    7 Water Pollution
    8 Wastewater Treatment
    9 Air Pollution
    10 Noise Pollution
    11 Solid Waste Management
    12 Hazardous Waste Management
    13 Sustainability and Green Engineering
    14 Ionizing Radiation

  - □ Hassenzahl, D. M., M. C. Hager and L. R. Berg (2017)
    Visualizing Environmental Science, 5th Edition
    1 The Environmental Challenges We Face
    2 Sustainability and Human Values
    3 Environmental History, Politics, and Economics
    4 Risk Analysis and Environmental Health Hazards
    5 How Ecosystems Work
    6 Ecosystems and Evolution
    7 Human Population Change and the Environment
    8 Air and Air Pollution
    9 Global Atmospheric Changes
    10 Freshwater Resources and Water Pollution
    11 The Ocean and Fisheries
    12 Mineral and Soil Resources
    13 Land Resources
    14 Agriculture and Food Resources
    15 Biodiversity and Conservation
    16 Solid and Hazardous Waste
    17 Nonrenewable Energy Resources
    18 Renewable Energy Resources

□ Wright, R. T. and D. F. Boorse (2016)
Environmental Science: Toward A Sustainable Future, 13th Edition

I. FRAMEWORK FOR A SUSTATAINABLE FUTURE
1. Science and the Environment
2. Economics, Politics, and Public Policy

II. ECOLOGY: THE SCIENCE OF ORGANISMS AND THEIR ENVIRONMENT
3. Basic Needs of Living Things
4. Populations and Communities
5. Ecosystems: Energy, Patterns, and Disturbance
6. Wild Species and Biodiversity
7. The Use and Restoration of Ecosystems

III. THE HUMAN POPULATION AND ESSENTIAL RESOURCES
8. The Human Population
9. Population and Development
10. Water: Hydrologic Cycle and Human Use
11. Soil: Foundation for Land Ecosystems
12. The Production and Distribution of Food
13. Pests and Pest Control

IV. HARNESSING ENERGY FOR HUMAN SOCIETY
14. Energy from Fossil Fuels
15. Nuclear Power
16. Renewable Energy

V. POLLUTION AND PREVENTION
17. Environmental Hazards and Human Health
18. Global Climate Change
19. Atmospheric Pollution
20. Water Pollution and Its Prevention
21. Municipal Solid Waste: Disposal and Recovery
22. Hazardous Chemicals: Pollution and Prevention

VI. STEWARDSHIP FOR A SUSTAINABLE FUTURE
23. Sustainable Communities and Lifestyles

Appendix A: Environmental Organizations
Appendix B: Units of Measure
Appendix C: Units of Measure

- HOMEWORK ASSIGNMENT #1 (No Handin Needed!)：

(1)請查詢並瀏覽以下法律條文：

環境基本法

環境部組織法（及其下屬機關組織法）

氣候變遷因應法

(2)請查詢並瀏覽以下相關主題之網頁及其內容

UN Sustainable Development Goals

台灣永續發展目標

台灣 2050 年淨零排放路徑