

國立臺北大學自然資源與環境管理研究所

115 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 and Supplemental Materials
- 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, geology and physical sciences** with engineering to solve **environmental issues**. Students in this major also need 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.
- https://en.wikipedia.org/wiki/Environmental_engineering
Environmental engineering is a professional engineering discipline related to environmental science. It encompasses broad scientific topics like **chemistry, biology, ecology, geology, hydraulics, hydrology, microbiology, and mathematics** to create solutions that will protect and also improve the health of living organisms and improve the quality of the environment. Environmental engineering is a sub-discipline of civil engineering and chemical engineering. While on the part of civil engineering, the Environmental Engineering is focused mainly on Sanitary Engineering.
- 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

□ Masten, S. J. and M. L. Davis (2024)

Principles of Environmental Engineering and Science, 4th Edition

- 1 Introduction
- 2 Chemistry
- 3 Biology
- 4 Materials and Energy Balances
- 5 Ecosystems
- 6 Risk Perception, Assessment and Management
- 7 Hydrology
- 8 Sustainability
- 9 Water Quality Management
- 10 Water Treatment
- 11 Wastewater Treatment
- 12 Air Pollution
- 13 Solid Waste Engineering
- 14 Hazardous Waste Management
- 15 Noise Pollution
- 16 Ionizing Radiation
- Appendix A: Properties of Air, Water, and Selected Chemicals
- Appendix B: List of Elements with their Symbols and Atomic Masses
- Appendix C: Periodic Table of Chemical Elements
- Appendix D: Useful Unit Conversion and Prefixes
- Appendix E: Greek Alphabet

□ 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.

□ Davis, M. L. and D. A. Cornwell (2023)

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
- Appendix A Properties of Air, Water, and Selected Chemicals
- Appendix B Noise Computation Tables and Nomographs
- Appendix C U.S. Customary System Units Conversion Factors

- Wright, R. T. and D. F. Boorse (2016)
Environmental Science: Toward A Sustainable Future, 13th Edition
 - I. FRAMEWORK FOR A SUSTAINABLE 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（氣候變遷因應法施行細則）

資源循環推動法（施行細則制訂中...）

法規命令：溫室氣體自願減量專案管理辦法、碳費收費辦法、自主減量計畫
管理辦法、溫室氣體減量額度交易拍賣及移轉管理辦法、氣候變
遷風險評估作業準則、循環產品及循環服務推動作業要點

(2)請查詢並瀏覽以下相關主題之網頁及其內容

UN Sustainable Development Goals, IEA Net Zero Roadmap / Net Zero by 2050

台灣永續發展目標、台灣 2050 年淨零排放路徑