

**CEE 345**  
**Environmental Material Balances**

- Catalog data:** 20-CEE-345. Environmental Material Balances. 3 ug. cr. Introduction to techniques of analysis for environmental systems. Application of concepts of material & energy balances to environmental systems as part of the engineering approach to problem solving. Topics include units & dimensions, process variables, reactive system balances, equations of state for ideal gases, phase equilibrium, gas-liquid systems, and energy balances on reactive processes.
- Prerequisites:** CEE pre-junior status.
- Textbook:** Cooper, Dietz and Reinhart (2000) *Foundations of Environmental Engineering*, Waveland Press, Inc., Prospect Heights, Illinois.
- References:** Extensive class handouts
- Coordinator:** Dr. Tim C. Keener, 472 ERC, 513-556-3676  
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- Lecture or Lab Topics:**
1. Introduction; Review of Dimensional Systems; Types of Pollution (½ lecture)
  2. Population Growth and Pollution; Energy Use (½ lecture)
  3. Environmental Ethics and Laws; Pollution Control (1 lecture)
  4. Concentrations; Solutions (1 lecture)
  5. Stoichiometry (1 lecture)
  6. Gas Laws (1 lecture)
  7. Equilibrium (2 lectures)
  8. Acid-Base Chemistry (2 lectures)
  9. Solubility Product (1 lecture)
  10. Reaction Kinetics (2 lectures)
  11. Mass Balances (2 lectures)
  12. Flow of Materials (1 lecture)
  13. Flow of Energy and Energy Balances (1 lecture)
  14. Combined Material and Energy Balances (1 lecture)
  15. Unsteady-State Processes (1 lecture)
- Computer Usage:** Students are required to solve multifaceted problems using personal computers with spreadsheet programs such as EXCEL with graphing capabilities.
- ABET criterion 3:** a, b, c, d, e, f, h, j, k
- ABET criterion 8:** a, b, c, e, f, g