ENVE2001: Process Analysis for Environmental Engineering
Winter 2019

Instructor: Pierre Wilder
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Office hours: by appointment only

Meeting time (MC5050): 8:35AM – 9:25AM Tues / Thurs
Problem analysis (run by TAs): 11:35AM – 2:25PM Fri
ME 3356 (A1), ME 4494 (A2), ME 3165 (A3), SA314 (A4):

Course objectives:
- To introduce the theory and practice associated with material and energy balances in chemical and environmental engineering systems.
- Develop quantitative analysis skills pertaining to flow systems with chemical/biochemical reactions and multiple input and output streams.
- Develop skills in applying thermodynamic principles to such systems
- Develop familiarity with industrial processes that have significant environmental interactions

Topics:
- Conservation of mass
  - Quantifying matter and mixtures, mols, mass, volume
  - Balancing the chemical reaction
  - Systems and processes: streams, components
  - Mass (material) balances
  - Complex systems, recycle, bypass
- Gases, vapours, liquids
  - Ideal vs Real gases
  - Multi-phase systems
  - Atmospheric air and psychrometry
- Conservation of Energy
  - Energy forms and enthalpy
  - Energy balances for systems with phase changes
  - Energy balances for systems with chemical reactions
- Introduction to Life-cycle Analysis

Grading:
Assignments (4) 10%
Assignments in Problem Analysis sessions (11) 10%
Midterm 25%
Final exam 55%

Text (optional): Basic Principles and Calculations in Chemical Engineering 8th edition (David Himmelblau and James Riggs)

Assignments in Problem Analysis (PA) sessions: The PA sessions are conducted as “weekly exam”: at the beginning of each session you will be given a problem set consisting of 3 – 5 questions. You have as much as 3 hours to work on the questions. At the end of the session the TAs will collect and grade your work. You may discuss the general approach to the problems with the TA and classmates, but you need to work independently on actual solutions. To pass this course, you must attend at least 9 PA sessions (and hand in your work).

Assignments and late policy: 4 assignments will be assigned throughout the course with a deadline provided. If you cannot meet a deadline, please make arrangements with the professor before the
assignment deadline; otherwise a mark of zero will be assigned. 50% of the grade will be deducted from the homework that was turned in late unless you can provide appropriate documentation.

**Academic Accommodation:** Students may need special arrangements to meet academic obligations during the term. For an accommodation request, the processes are described below.

**Pregnancy obligation:** Contact your instructor with any requests for academic accommodations during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

**Religious obligation:** Contact your instructor with any requests for academic accommodations during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

**Academic Accommodations for Students with Disabilities:** If you have a disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact PMC no later than two weeks before the first in class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor to ensure accommodation arrangements are made. carleton.ca/pmc

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**Accommodation for Student Activities:** Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

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