

Spring 2011

WEST VIRGINIA UNIVERSITY
DEPARTMENT OF CHEMICAL ENGINEERING
Course Outline
MATERIAL AND ENERGY BALANCES 2, ChE 202

COURSE GOAL: To continue with the principles of chemical engineering and the methodology for doing calculations in this discipline, as started in ChE 201. We will focus here on steady-state and batch energy balances, and unsteady-state material and energy balances.

LEARNING OUTCOMES: At the conclusion of this course, you will

- understand how to set up elementary energy balances for chemical engineering processes, and to couple these with material balances to solve for flows, temperatures, concentrations and other parameters of process interest, in partial fulfillment of *ChE Educational Outcome 1* (see “Undergraduate Program Mission, Outcomes and Objectives” statement, attached);
- understand how to modify these balances for multi-phase systems, in partial fulfillment of *ChE Educational Outcome 1*;
- understand how to modify these for chemical reactions, in partial fulfillment of *ChE Educational Outcome 1*;
- be able to estimate and/or evaluate data using correlations, charts or thermodynamic principles, in partial fulfillment of *ChE Educational Outcome 5*;
- be able to use appropriate software, including Excel, as coordinated with ChE 230, in partial fulfillment of *ChE Educational Outcome 3*;
- obtain continued experience in the solution of open-ended design problems, in partial fulfillment of *ChE Educational Outcomes 1,2, 6,7*.

This course will require individual and group study and practice, as provided by homework and project assignments, in partial fulfillment of *ChE Educational Outcome 4*.

INSTRUCTOR: Dr. Dady B. Dadyburjor, 421 ESB, 3-9337, dady.dadyburjor@mail.wvu.edu

TEACHING ASSISTANT: Zachary Mayes

OFFICE HOURS: Arranged during the first week of class to take into account other commitments of students and instructors.

You are encouraged to take full advantage of these office hours, or to request alternative arrangements as needed.

TEXTBOOKS: R.M. Felder and R.W. Rousseau, Elementary Principles of Chemical Processes (with workbook), 3rd Edition, John Wiley & Sons, New York, 2005. Required.

GRADING POLICY: On the basis of homework (20 percent), design project (15 percent), three quizzes (10 percent each), and a final examination (35 percent).

Homework - Homework will be regularly assigned, and will be collected on the due date.
- Although you may work on homework problems in groups, all homework submitted must be individual work. Homework which appears to be copied may result in zero credit for all concerned, at the discretion of the T.A. and the instructor.

- Late assignments will not be accepted.

- Solutions to the homework will be put on the web shortly after the assignments are due.

These can be accessed using “Professor’s Username:” dadyburjor and “Professor’s Password:” tba. You

are encouraged to review the solution **even when full credit has been received** for the assignment.

- For questions of credit, please approach the T.A. first; you are encouraged to approach either the T.A. or the instructor (or both) for questions of content.
- Requests for re-evaluation of homework must be made **within one week** after they are returned. The rationale for re-evaluation must be **in writing**.

Design project - Details will be made available shortly.

- Students will be divided into groups. It is expected that each member of the group will participate equally in the project and will receive a shared grade. Students not adopting this philosophy will be graded accordingly.

Quizzes

- These will be open-textbook, in-class examinations.
- No collaboration of any sort is permitted.
- The schedule of quizzes is given in the Progression Section, below.
- Make-up quizzes will be allowed only in case of **certifiable medical emergencies**, or approved University activities for which **advance permission** must be obtained from the instructor.
- Requests for re-evaluation of quizzes must be made **within one week** after they are returned. The rationale for re-evaluation must be **in writing**.
- If the fire alarm goes off, the resolution of the situation is at the discretion of the instructor.

Final examination

- This will be an open textbook, in-class, **comprehensive** test.
- No collaboration of any sort is permitted.
- If the fire alarm goes off, the resolution of the situation is at the discretion of the instructor.

Numerical grades, not letter grades, will be issued for individual homework assignments, tests, the design project, and the final examination. Letter grades will be issued only for the overall performance in the course, following the weighting above. However, an account of class performance will be provided after every test. The following serve as “ceilings” of minimum performance to receive the corresponding grades: “A”=90, “B”=80, “C”=70, “D”=60. They are “ceilings” in that they may be adjusted downwards.

OTHER CLASS POLICIES

Class sessions between ChE 202 and ChE 230 may be interchanged occasionally, due to other responsibilities of the instructors. You will be notified of these changes as early as possible.

Attendance at class sessions is **very strongly recommended**. Those not in class for **any** reason are responsible for all material covered, homework assigned, etc., in that session.

Social-Justice Statement: “WVU is committed to social justice. I concur with that commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and nondiscrimination. WVU does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type of accomodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Disability Services (304-293-6700)”

<u>PROGRESSION:</u> <u>Week Starting</u>	<u>Tentative</u> <u>Date</u>	<u>Chapter</u>	<u>Other Activity</u>
January 10 January 17		7	
January 24 January 31 February 7	<i>February 9</i>	8	<i>Quiz I</i>
February 14		8 (contd.)	
February 21 February 28 March 7 March 14	<i>March 14</i>	9	<i>Quiz II</i>
March 21 March 28		9 (contd)	Spring Break
April 4 April 11	<i>April 13</i>	11	<i>Quiz III</i>
April 18 April 25		11 (contd)	Design Presentations, Review
	<i>Friday, May 6, 11am-1pm</i>		<i>Final Examination</i>

West Virginia University
Department of Chemical Engineering
Undergraduate Program Mission, Objectives, and Outcomes

Mission

To prepare students to become practicing chemical engineers, consistent with the objectives of the College of Engineering and Mineral Resources and West Virginia University.

Program Objectives

1. Graduates will be successful in their professional careers and/or post-graduate training as demonstrated by their abilities to solve traditional chemical engineering problems, to solve problems in extended applications of chemical engineering (especially biological) as well as non-related fields, and to develop new and valuable ideas.
2. Graduates will be able to work competitively in diverse professional environments as demonstrated by their abilities to work on teams, to work independently, to provide leadership, to mentor junior co-workers, and to communicate effectively.
3. Graduates will demonstrate professional character exhibited by their ethical behavior, their pursuit of professional registration, their pursuit of lifelong learning opportunities, their commitment to responsible safety practices, and their ability to articulate the environmental impact of their work.

Educational Outcomes

1. Graduates will understand and be able to analyze entire chemical processes, including those with life science applications.
2. Graduates will be proficient in the oral and written communication of their work and ideas.
3. Graduates will be proficient in the use of computers, recent computer software, and computer-based information systems.
4. Graduates will have the ability to learn independently but will also be able to participate effectively in groups.
5. Graduates will be able to design effective laboratory experiments, to perform laboratory experiments, to gather data, to analyze data, and to test theories.
6. Graduates will be prepared for a lifetime of continuing education.
7. Graduates will understand the safety and environmental consequences of their work as chemical engineers and will be able to design safe processes.
8. Graduates will understand their professional and ethical responsibilities.
9. Graduates will have the broad education necessary to understand the impact of engineering solutions in a global and societal context.