CHE 299 (6 Cr.) – Professional Workskills – Material & Energy Balances

Summer Quarter 2015
School of Chemical, Biological, and Environmental Engineering
Oregon State University
2015.08.19

COURSE SYLLABUS

Instructor: Travis Walker
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Dates: 2015.06.22-2015.09.04
Lectures: Online

Course Description: (CRN: 73032) CHE 299. PROFESSIONAL WORKSKILLS – MATERIAL & ENERGY BALANCES (6). Material balances, thermophysical, and thermochemical calculations. Energy balances, thermophysical and thermochemical calculations. **PREREQS:** MTH 252 [C] or MTH 252H [C] and general chemistry and second-year standing in engineering.

This course combines the material for CBEE 211 (Material Balances and Stoichiometry) and CBEE 212 (Energy Balances). This course, CHE 299, will cover material balances, energy balances, and thermophysical and thermochemical calculations. This course provides students with fundamentals that are essential throughout their program towards a B.S. degree in Chemical, Biological, or Environmental Engineering, with an emphasis on material and energy balances on processes involving physical, chemical, and biological changes primarily in single phase systems.

Website: `https://oregonstate.instructure.com/`
(Please make sure you have access to the Oregon State Instructure website, since all course materials and announcements will be available there.)

Prerequisites: Departmental approval. MTH 252 [C] or MTH 252H [C] and general chemistry and second-year standing in engineering.

Required Textbook: Felder, R.M., R.W. Rousseau. *Elementary Principles of Chemical Processes,* 3rd Ed. Wiley (2005).

Required Online Homework System: Sapling Interactive Homework & Instruction System.

Recommended Textbooks: Felder, R.M., R.W. Rousseau. *Elementary Principles of Chemical Processes, Student Workbook,* 3rd Ed. Wiley (2005).

Course Weighting:

Homework	25%
Weekly Quiz	30%
Cumulative Final Examination	45%

Grade Policy: Work received up to 24-hours late will receive 50% credit. Work received beyond 24-hours late will receive 0% credit. Group work on homework is permitted, but each student must turn in his or her own individual assignment with a list of contributors. Group work on quizzes is not permitted.

Grading: If you determine that a regrade is necessary, the entire assignment will be regraded.

Final performance percentage will be assigned a minimum letter grade by the following scale (implying that the percentage requirements for a particular grade may be decreased at the instructors' sole discretion but will not be increased):

94-100	A	74-76	C
90-93	A-	70-73	C-
87-89	B+	67-69	D+
84-86	B	64-66	D
80-83	B-	60-63	D-
77-79	C+	0-60	F

Course Objectives: By the end of the course, a student will be able to do the following:

- Material Balances
  - Apply knowledge from mathematics and science to define process system variables for basic process calculations involving material balances and phase equilibrium;
  - Translate process descriptions (word problems) into appropriate process diagrams and systems of linearly independent equations necessary for solving material balance problems. Formulate process descriptions from process schematics or mathematical representations of material balances;
  - Identify and state key concepts needed to solve a given material balance problem. Qualitatively predict responses based on conceptual understanding, without doing calculations;
  - Solve material balances for (a) non-reactive, single-unit processes, (b) non-reactive, multiple-unit processes, (c) reactive, single-unit processes, (d) reactive processes with separation and recycle, (e) non-reactive processes involving vapor-liquid equilibrium;
  - Use appropriate technology (e.g., calculators, software) to more efficiently and/or accurately solve material balance problems. Be able to apply elementary programming knowledge from CBEE 102 to solve material balance problems;
- Energy Balances

- Define and solve steady-state energy balance problems on non-reactive processes;
- Define and solve steady-state energy balance problems on reactive processes;
- Define and solve steady-state problems that include both mass and energy balances;
- Define and solve unsteady-state material and energy balance problems.

Course Structure:

Communication

The Canvas announcement tab (CRN 60228) will be used to distribute information and materials, including supplemental material for lectures, problem sets and solutions, grades, and other material relevant to the course. Students should become familiar with the Canvas site and check it frequently. All scores will be posted in the Canvas grade center; however, final grades will be subject to change, as the instructor is still learning to use the Canvas grade book.

Please contact me by email or on the Canvas discussion forum for help with subject material. If you have a question on the course content, I encourage you to post your question on the Canvas discussion forum, as other students will likely have similar questions, and I can respond to the entire class.

Work Submission

You must have access to a scanner so that you can submit your work in portable document format (PDF). The resolutions of your scanner must be high enough that I can read your handwriting. If you are not sure if you scanner meets this requirement, please email me a handwritten sheet of paper, and I will let you know if the resolution is acceptable.

Guidelines for Preparing and Submitting Quizzes

- A scanned copy of your hand written work is required.
- Print the assignment and complete the work in the space given. If additional paper is needed, attach the work immediately after the problem, and clearly write your name, date, and problem number in the upper right hand corner of the page.
- Write the following in the upper right corner of each page:
  - Last name, first name
  - CHE 299
  - Problem Set Number
  - Page number/Total pages
- Show all of your work. Draw a box around your final answer(s).
- For graphical solutions, use graph paper or commercial plotting software (e.g., MATLAB or Excel). Label the axes of your graph and include units.
- Provide computer printouts, if used, on a separate sheet.
- Submit your work through Canvas.

Email

Every student must have an ONID account. Every student muse read his/her email daily! Note that a class email distribution list will be generated from ONID accounts. Beware of forwarding your ONID account to a non-OSU account, as many commercial internet providers (such as Yahoo!, Hotmail, Gmail, etc.) will have distribution list filters on received messages.

Weekly Schedule

Monday – Begin reading the material outlined in the week overview. A weekly Sapling homework assignment will be posted on Canvas. Go to the Sapling website to complete the assignment. This assignment can be printed from the website if you want to look at it while doing the reading.

Tuesday – Continue working on the weekly reading and Sapling homework.

Wednesday – An *ungraded* practice quiz with solutions will be posted on Canvas.

Thursday – The Sapling homework must be completed by 23:00 PST.

Friday – The weekly quiz will be posted on Canvas. This quiz will be graded and is due the following Monday by 1000 PST. Quizzes must be downloaded, completed, and uploaded to Canvas by the due date. The quiz is to be completed on your own.

While the University is a place where the free exchange of ideas and concepts allows for debate and disagreement, all classroom behavior and discourse should reflect the values of respect and civility. Behaviors that are disruptive to the learning environment will not be tolerated. As your instructor, I am dedicated to establishing a learning environment that promotes diversity of race, culture, gender, sexual orientation, and physical disability. Anyone noticing discriminatory behavior, or who feels discriminated against, should bring it to the attention of the instructor or other University personnel as appropriate.

Lecture

This course contains no lecture component. The instructor will guid you on what to study, but you are responsible for progressing with the reading material, Sapling homework, and quizzes.

Homework

Homework will be assigned every week and will be due on Thursdays at 2300 PST. Homework will distributed through the Sapling website.

Quizzes

Quizzes will be assigned every week and will be due on Mondays at 1000 PST. The weekly quizzes will be available on Canvas. You will download the quiz, print it, complete the exam, scan the completed exam to your computer, and submit the quiz through Canvas. During quizzes you may only use your copy of the required textbook, any materials that have been distributed to you, and any notes that you have taken yourself. You cannot "share" materials during a quiz or use copies of pages from the book. You may write notes in your textbook about topics covered in class but not included in the textbook.

Make-up quizzes will only be allowed in the case of documented emergencies or with prior authorization (i.e., prior to the examination period) from the instructor. If you must miss one of the quizzes for an emergency situation, please let me know as soon as possible (travis.walker@oregonstate.edu). You will not have an opportunity to make up the quiz without an approved reason.

Final Exam

One cumulative, timed, and proctored final examination will exist during the last week of class. The date of the final examination for students on campus is Monday, 2015.08.31, from 1000-1300 PST. Those students that live away from campus must take the exam on Monday, 2015.08.31, or Tuesday, 2015.09.01, Pacific Standard Time.

Information regarding proctoring can be found at the following website.

`http://ecampus.oregonstate.edu/services/proctoring/`

During the examination you may only use your copy of the required textbook, any materials that have been distributed to you, and any notes that you have taken yourself. You cannot "share" materials during a examination or use copies of pages from the book. You may write notes in your textbook about topics covered in class but not included in the textbook. Laptops and phones are not allowed during examinations. Calculators will be allowed on the final examination.

Make-up examinations will only be allowed in the case of documented emergencies or with prior authorization (i.e., prior to the examination period) from the instructor. If you must miss the examination for an emergency situation, please let me know as soon as possible (travis.walker@oregonstate.edu). You will not have an opportunity to make up the examination without an approved reason.

Dates:

Add/Drop Deadline 2015.07.06
Final Exam . . . . . 2015.08.31 1000-1300 PST

Sapling Learning

The homework for CHE 299 will be delivered through Sapling Learning. The fee to sign up for this system is $40.00. The instructions to register for the content, as provided by Sapling Learning, are provided below.

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Students:

1. Go to http://saplinglearning.com and click on your country at the top right.

2a. If you already have a Sapling Learning account, log in and skip to step 3.

2b. If you have a Facebook account, you can use it to quickly create a Sapling Learning account. Click "Create an Account", then "Create my account through Facebook". You will be prompted to log into Facebook if you aren't already. Choose a username and password, then click "Link Account". You can then skip to step 3.

2c. Otherwise, click "Create an Account". Supply the requested information and click "Create My Account". Check your email (and spam filter) for a message from Sapling Learning and click on the link provided in that email.

3. Find your course in the list (you may need to expand the subject and term categories) and click the link.

4. If your course requires payment, select a payment option and follow the remaining instructions.

Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up or throughout the term, if you have any technical problems or grading issues, send an email to support@saplinglearning.com explaining the issue. The Sapling Learning support team is almost always faster and better able to resolve issues than your instructor.

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Tentative Course Outline (2015.08.19):

Week	Dates	Topic	Reading*
01	2015.06.22-28	Introduction to engineering calculations Processes and process calculations	2.0-2.8 3.0-3.6
02	2015.06.29-07.05	Mass conservation laws Balances on multiple-unit processes Material balances with recycle and bypass streams	4.0-4.3 4.4 4.5
03	2015.07.06-12	Material balance on reactive systems Stoichiometry and equilibrium of chemical reactions Multiple reactions	4.6
04	2015.07.13-19	Material balances on reactive processes	4.7
05	2015.07.20-26	Single-phase systems Liquid and solid densities Ideal gases	5.0-5.2
06	2015.07.27-08.02	Single-component phase equilibrium Gibbs Phase rule Gas-Liquid systems: one condensable component Ideal phase equilibrium in multi-component	6.0-6.1 6.2 6.3 6.4
07	2015.08.03-09	Simple thermodynamic concepts Energy balances on closed systems Energy balances on open systems at steady-state Tables of thermodynamic data	7.0-7.2 7.3 7.4 7.5
08	2015.08.10-16	Elements of energy balance calculations Changes in pressure at constant temperature Changes in temperature Phase change operations	8.1 8.2 8.3 8.4
09	2015.08.17-23	Heats of reaction for processes Measurement and calculation of heats of reaction	9.0-9.1 9.2
10	2015.08.24-30	Heats of formation and heats of combustion Energy balances on reactive processes	9.3-9.4 9.5
11	2015.08.31-09.04	Final exam	

*Felder & Rousseau

OSU STATEMENTS:

From the Office of the Dean of Students (1995.12.13): Behaviors which are disruptive to the learning environment will not be tolerated, and will be referred to the Office of the Dean of Students for disciplinary action. Behaviors which create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office.

Web link : `http://oregonstate.edu/oei/affirmative-action`

Statement Regarding Students with Disabilities Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098.

Web link: `http://ds.oregonstate.edu/`

Academic Honesty Any instances of dishonesty in academic work will be treated according to OSU Academic Regulations. The Statement of Expectations for Student Conduct is given in the OUS OAR #576-015-0020, accessible at the following link:

Web link: `http://studentlife.oregonstate.edu/studentconduct/offenses-0`.

The policy is stated below:

> Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the Student's own efforts or the efforts of another.
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> It includes:
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> (i) CHEATING - use or attempted use of unauthorized materials, information or study aids, or an act of deceit by which a Student attempts to misrepresent mastery of academic effort or information. This includes but is not limited to unauthorized copying or collaboration on a test or assignment, using prohibited materials and texts, any misuse of an electronic device, or using any deceptive means to gain academic credit.
> (ii) FABRICATION - falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.
> (iii) ASSISTING - helping another commit an act of academic dishonesty. This includes but is not limited to paying or bribing someone to acquire a test or assignment, changing someone's grades or academic records, taking a test/doing an assignment for someone else by any means, including misuse of an electronic device. It is a violation of Oregon state law to create and offer to sell part or all of an educational assignment to another person (ORS 165.114).
> (iv) TAMPERING - altering or interfering with evaluation instruments or documents.
> (v) PLAGIARISM - representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.