OREGON STATE UNIVERSITY
SCHOOL OF CHEMICAL, BIOLOGICAL, AND ENVIRONMENTAL ENGINEERING

Course: **CHE 299, Professional Workskills/Material and Energy Balances Summer, 2014**

Credits: 6 term credit hours

Instructor: Richard Oleksak, Travis Walker
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Office Hours:
Please contact me by email or on the Blackboard 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 Blackboard discussion forum. Likely others have the same question and I can respond to the entire class.

Required Text:
Felder, R.M., Rousseau, R.W. Elementary Principles of Chemical Processes, 3rd Ed. John Wiley & Sons, New York, NY, 2005. The accompanying Student Workbook is optional.

Required Online Homework System:
This course will use the Sapling Interactive Homework & Instruction System for homework. The fee for this system is $40.00 and you must sign up online. Information for this system is detailed below.

Email:
Every student must have an ONID account. Read email daily! Note: 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.

Course Prerequisites:
Sophomore standing in engineering, general chemistry, integral calculus

Course Description:
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.

COURSE OUTLINE
Reading Assignment in Felder and Rousseau

Week 1:
- Introduction to engineering calculations 2.0-2.8
- Processes and process calculations (mass, volume, flow rate, composition, pressure and temperature) 3.0-3.6

Week 2:
- Mass conservation laws 4.0-4.3
- Balances on Multiple-Unit Processes 4.4
- Material Balances with Recycle and Bypass Streams 4.5

Week 3:
- Material Balance on Reactive Systems 4.6
- Stoichiometry and equilibrium of chemical reactions
- Multiple reactions

Week 4:
- Material Balances on Reactive Processes 4.7

Week 5:
- Single-phase systems. Liquid and solid densities. Ideal gases. 5.0-5.2

Week 6:
- Single-component phase equilibrium 6.0 – 6.1
- Gibbs Phase rule 6.2
- Gas-Liquid systems: one condensable component 6.3
- Ideal phase equilibrium in multi-component 6.4

Week 7:
- Simple thermodynamic concepts 7.0 – 7.2
- Energy balances on closed systems 7.3
- Energy balances on open systems at steady-state 7.4
- Tables of thermodynamic data 7.5

Week 8:
- Elements of Energy Balance Calculations 8.1
- Changes in pressure at constant temperature 8.2
- Changes in temperature 8.3
- Phase change operations 8.4

Week 9:
- Heats of reaction for processes 9.0 – 9.1
- Measurement and Calculation of Heats of Reaction 9.2

Week10:

- Heats of formation and heats of combustion 9.3 – 9.4
- Energy balances on reactive processes 9.5

Week11:

- Final exam

SAMPLE WEEKLY SCHEDULE

Monday – Begin reading the material outlined above. Weekly Sapling homework assignment will show up on Blackboard. Go to the Sapling website to complete. This assignment can be printed from the website if you want to look at it while doing the reading.

Tuesday – Work on weekly reading and Sapling homework.

Wednesday – An UNGRADED Practice Test will be posted on Blackboard.

Thursday – Sapling homework must be completed by 11:00 PM (23:00).

Friday – Exam will be posted on Blackboard. This exam will be graded and is due the following Monday by 10 AM Pacific Time. Exams must be downloaded and completed then uploaded to Blackboard by the due date. The exam is to be completed ON YOUR OWN!!

ADDITIONAL COURSE DETAILS

Blackboard

Course materials will be posted on the CHE 299 Blackboard site. These materials include supplemental material for lectures, problem sets and solutions, grades and other material relevant to the course. Students should become familiar with the Blackboard site and check it frequently.

There is no lecture component for this course. I will guide you on what to study, but it is your responsibility to keep up with the reading material, Sapling homework, Practice Tests and Test.

You must have access to a scanner or digital camera capable of resolutions of at least 2 megapixels. If you are not sure if your scanner or camera meets this requirement, please email me a photo of a handwritten sheet of paper and I will let you know if the resolution is acceptable. The weekly exams will be available on blackboard. You will download the exam, print it, complete the exam, scan the completed exam to your computer, and then submit to me through blackboard. A digital scanner is preferred.

Guidelines for Preparing and Submitting Exams

- A scanned copy or photograph of your hand written work is required. A scanned copy is preferred.

- 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:
  CHE 299, Your Name
  Problem Set No.
  Page number/Total pages
- Show all of your work. Draw a block around your final answer(s).
- For graphical solutions, use graph paper. Label the axes of your graph and include units.
- Provide computer printouts, if used, on a separate sheet.
- Submit your work through Blackboard.

PERFORMANCE EVALUATION:

Weekly Homework **25 %**

Weekly homework sets will be completed through the Sapling Interactive Homework & Instruction System. You will need to sign up for this system and pay the fee of $40.00. Details for the Sapling Interactive Homework System are below. Please refer to the "Grading Policies" in your Sapling account to understand how the homework is graded. You will have an unlimited number of attempts for the homework but for each attempt 5% of the homework score will be deducted. There will be no extended deadlines for the homework.

Weekly Test **30 %**

Weekly Exam will be assigned and graded. The solutions to the test will be provided after the due date. Exams submitted late will be not be graded.

Cumulative Final **45 %**

There will be a cumulative final at the end of the term. The details of this final will be provided during the course.

Final performance percentage will be assigned a letter grade by the following scale:

100-94	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+	60<	F

COURSE LEARNING OBJECTIVES

Material Balance Course Learning Objectives (approximately first half of course)

1. Apply knowledge from mathematics and science to define process system variables for basic process calculations involving material balances and phase equilibrium.
2. 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.
3. Identify and state key concepts needed to solve a given material balance problem. Qualitatively predict responses based on conceptual understanding, without doing calculations.
4. 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.
5. 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 Balance Course Learning Objectives (approximately second half of course)
1. Define and solve steady-state energy balance problems on non-reactive processes;
2. Define and solve steady-state energy balance problems on reactive processes;
3. Define and solve steady-state problems that include both mass and energy balances; and
4. Define and solve unsteady-state material and energy balance problems.

COURSE POLICIES

Blackboard
Course materials will be posted on the CHE 299 Blackboard site. These materials include supplemental material for lectures, problem sets and solutions, grades and other material relevant to the course. Students should become familiar with the Blackboard site and check it frequently.

Academic Honesty Statement
Academic honesty is very important. You will be expected to conduct yourself in a professional manner. Academic dishonesty such as plagiarism and cheating will not be tolerated. Therefore, students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

- cheating- use or attempted use of unauthorized materials, information or study aids,
- fabrication- falsification or invention of any information,
- assisting- helping another commit an act of academic dishonesty,
- tampering- altering or interfering with evaluation instruments and documents, or
- plagiarism- representing the words or ideas of another person as one's own.

For more information about academic integrity and the University's policies and procedures in this area, please refer to the Student Conduct web site at:
http://www.orst.edu/admin/stucon/achon.htm and the section on Academic Regulations in the OSU Schedule of Classes.

Course Values Statement
I am dedicated to establishing an inclusive learning environment that values all students' experiences. Therefore, disrespectful and demeaning statements, attitudes, and behaviors based on age, ability, ethnicity/race, gender identity/expression, immigration status, marital/parental

status, military/veteran's status, national origin, political affiliation, religious/spiritual beliefs, sexual orientation, socioeconomic status will not be tolerated.

Disability Statement

Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD 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 SSD should contact SSD immediately at 737-4098.

Sapling Interactive Homework Sign Up Instructions

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 sign up are 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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