

## **CEN 231: MASS AND ENERGY BALANCES SYLLABUS**

Fall 2014: 8/xx/2014 – 12/xx/2014, course #xxxxx

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### **INSTRUCTOR INFORMATION**

**Instructor:** Dr. Katie Cadwell

**Email:** kdcadwel@syr.edu

**Phone:** 315-443-4756

**Office Hours:** 341 Link Hall, M/W xxx, Tu /Th xxx, **or by appointment**

**Teaching Assistant:** TBA

**Email:** TBA

**Office Hours:** TBA

### **COURSE INFORMATION**

**Course Catalog Description:** Material balances for single units and multistage processes. Recycle and bypass streams. Gas laws. Energy balances including latent and sensible heat effects, heats of reaction. Applications to biomedical processes. (3 credits)

**Class Schedule:** Tuesdays & Thursdays 12:30p-1:50p in **202 Hall of Languages**

**Pre-requisites:** There are no official pre-requisites for this course, however to be fully prepared to succeed, students in this course should possess the following knowledge and skills:

1. algebraic manipulations, including logarithm and exponent rules, differentiation and integration (MAT 295 & 296)
2. fundamental principles of chemistry including molecular structure, stoichiometry, chemical equilibrium and introductory thermodynamics (CHE 106 & 116)
3. physics at a minimum of the secondary school level
4. familiarity with computers, spreadsheet software and the Internet (ECS 101 & 104)

**Textbook (required):** *Introduction to Chemical Processes: Principles, Analysis, Synthesis* by Regina M. Murphy (ISBN 9780072849608). **Check to see if e-book is available.**

### **Additional References and Tools:**

1. *Elementary Principles of Chemical Processes, 3<sup>rd</sup> ed.* by R.M. Felder and R.W. Rousseau (on reserve at the SciTech Library in Carnegie Hall).
2. *MatLab, EES, MathCAD, Excel, Polymath, or Maple* (all on ECS server). *We will do an extremely brief introduction/review of EES, MathCAD, and MatLab the second week of the semester.*
3. *Syracuse University Library Subject Guides: Biomedical & Chemical Engineering Resources*, (<http://researchguides.library.syr.edu/BMCE>). This guide, put together by our engineering librarian, Annie Rauh, contains many useful resources that must be accessed through this site for licensing purposes. Also accessible via the course Blackboard page under "Course Information."
4. **AEW for Mass & Energy!!!** Listed as ECS 200, there are currently **xx sections: M0xx on xxxdays from xxx-xxxpm with xxx and M0xx on xxxdays from xxx-xxxpm with xxx**. AEW starts the second week of classes, and you must contact Ms. Kate Pynn (krpynn@syr.edu) to enroll.
5. *AEW Office Hours* – **ANYONE** may attend the AEW facilitators' office hours, you need not be officially enrolled in an AEW section to do so. Days/times/locations TBA.

## **RESPONSIBILITIES AND POLICIES:**

**Academic Integrity:** The Syracuse University Academic Integrity Policy holds students accountable for the integrity of the work they submit. Students should be familiar with the Policy and know that it is their responsibility to learn about instructor and general academic expectations with regard to proper citation of sources in written work. The policy also governs the integrity of work submitted in exams and assignments as well as the veracity of signatures on attendance sheets and other verifications of participation in class activities. Serious sanctions can result from academic dishonesty of any sort.

**Learner Responsibilities:** As a student in this class, I expect you to take responsibility for your own learning, be prepared for class, be an enthusiastic participant during class, treat others with tolerance and respect, act responsibly and reliably in group work, and set high standards for your work.

**Instructor Responsibilities:** As your instructor, I commit to communicating openly and frequently with you about this class. I will maintain a professional, safe learning environment adhering to the policies of the university. You can generally expect a reply to communication, via e-mail or in person, within 24 business hours. As your instructor, I retain the right to make changes to this syllabus based on the timeline of the class, feedback from learners, and/or logistical issues and will inform you as soon as a change is made.

**Use of Electronic Devices:** The use of electronic devices such as cell phones, laptop computers, PDA's, mp3 players and the like is not permitted during lecture; these devices should be turned off. The use of cell phones and other communication devices during exams is considered cheating and will result in a score of zero for the exam and further disciplinary action as appropriate.

**Blackboard & Email:** A Blackboard course site has been created for this class and can be accessed at <http://blackboard.syr.edu/>. You are expected to check the course site regularly for announcements, assignments, and additional resources. Additionally, your current course grade can be accessed there. I will make major announcements both via Blackboard and your SU email account, which you are also expected to check regularly. "I didn't check my email/Blackboard" is not an acceptable excuse.

**Professional Communication:** All e-mail correspondence with the instructor should be conducted in a formal and professional manner. This includes a proper address (Prof. Cadwell, Dr. Cadwell, etc.), correct spelling, grammar, and punctuation, and signing your name at the end. E-mails of the form "*wat time do u want me to stop by office <unsigned>*" will not receive a reply.

**Religious Observances:** SU's religious observances policy, found at [http://supolicies.syr.edu/emp\\_ben/religious\\_observance.htm](http://supolicies.syr.edu/emp_ben/religious_observance.htm), recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes. An online notification process is available through *MySlice/Student Services/Enrollment/My Religious Observances* from the first day until the end of the second week of class.

**Students with Special Needs:** If you believe that you need academic accommodations, please contact the Office of Disability Services (ODS), <http://disabilityservices.syr.edu>, 804 University Ave., Room 309, 315-443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students "Accommodation Authorization Letters" as appropriate. Accommodations may require early planning and are generally not provided retroactively; please contact ODS as soon as possible. **If you receive testing accommodations via ODS, you must bring me a test scheduling sheet to arrange this at least 1 week in advance of the exam - I do all of my accommodations via their student testing center and cannot provide them myself.**

<b>Grading Scale: &amp; Components</b>	92 – 100%	A	78 – 79.9%	C+	2 Mid-semester Exams (2 x 25%)	50%
	90 – 91.9%	A-	72 – 77.9%	C	Exam 3 (Finals Week)	25%
	88 – 89.9%	B+	70 – 71.9%	C-	Homework, Quizzes***see note	10%
	82 – 87.9%	B	65 – 69.9%	D	Team Project & Presentation	15%
	80 – 81.9%	B-	Below 65%	F	Total	100%

**Attendance and Participation:** Attendance of this class is crucial: students who miss more than a very few class periods tend to do poorly. It is better to quietly join the class late than to miss it entirely. Although this course is lecture-based, a significant portion of class will be devoted to practice in small groups. By working together, we can all evaluate our understanding of concepts and work to help each other grasp new ideas. You are expected to actively participate in both small group and whole class discussions. You are also expected to treat your fellow students with respect. If your final grade is just below (within 0.4%) the cut-off for next letter grade, I *may* consider your attendance and participation when deciding whether or not to assign the higher grade.

**Exams:** Three exams will be given during the course of the semester – two during regular classes and the third during finals week. Make-up exams will differ from the original exams, will likely be harder, and will only be given in the case of unavoidable, *verifiable* excuse. If you miss an exam, you must contact me as soon as possible to schedule a make-up, preferably in advance.

**Final Exam:** The third exam (non-comprehensive, although you will need skills from previous material) is scheduled for **xxxday, Dec. xx, xxxp-xxxxp**.

**Homework and Quizzes:** Assignments will be passed out in lecture and made available via Blackboard. Assignments are due at the beginning of lecture on their due date – however, I will not collect all assignments. Completion and understanding of these assignments, in addition to reading the textbook and taking notes, working through examples, and viewing online lectures, should help to prepare students for unannounced quizzes. I will drop the lowest 2-4 quizzes and/or homework scores, the final number dropped depending upon how many are collected during the semester. Quizzes missed due to tardiness or absence may not be made up, period.

Collaborating on homework is acceptable and can be beneficial. This process is officially known as peer-facilitated learning. However, experienced graders can easily spot copying versus collaboration, and I expect that you have done all work that you turn in. If you consistently rely on copying homework, this will lessen the odds that you will perform well on exams. Many a student has confused the ability to follow another's work with being able to generate the solution on their own – don't fall into this trap!

*Collaborating on quizzes and exams is cheating and will be dealt with according to college policies.*

**Late Assignments:** Late assignments will not generally be accepted without prior arrangement. If you must be absent, you can send an assignment with a friend or scan and send via email ([kdcadwel@syr.edu](mailto:kdcadwel@syr.edu)). In any case you must contact me about the assignment before the end of the due date for consideration of late acceptance. Repeated late assignments will not be accepted. No assignments turned in after solutions or corrected versions are made available will be accepted.

**Team Project & Presentation:** Students will work in small, assigned teams outside of class on a series of complex problems. More information will be provided in class.

**SAGE and CATME:** Students will be required to enroll in the SAGE and CATME online surveys the first week of class. SAGE is an online self-assessment tool that students will be expected to complete weekly (it takes 5 minutes). CATME is an online team-forming software program that Dr. Cadwell will use to assign project teams and assess homework skills. Points are not given for completing these tasks, but students can lose up to 3% of their final course grade for failing to complete >75% of the weekly SAGE surveys, and there is a penalty to the team project grade for students not submitting the CATME surveys by their deadlines.

**COURSE OBJECTIVES:** This course has five primary objectives

- A. Develop a methodology for solving engineering problems
- B. Impart an understanding of biochemical/chemical engineering processes and process design
- C. Elucidate the fundamentals of materials and energy balances
- D. Examine the applications of material balances to single-phase and multiphase systems and the applications of energy balances to non-reactive and reactive processes
- E. Provide experience with computational techniques

**COURSE OUTCOMES:** Successful course completion should result in the following student outcomes

- A. The student should be proficient at identifying the critical issue or issues in a problem and translating technical information into a mathematical analysis, possess the skills necessary to solve many engineering problems, be able to present clear and incisive problem solutions, and have the ability to work effectively in peer groups. [program outcomes a, e, f, i, k, l]
- B. The student should be cognizant of the activities and responsibilities of biochemical/chemical engineers and the nature of biochemical/chemical processes and have an appreciation of the major principles of engineering design. [program outcomes a, c, e, j]
- C. The student should understand how the concepts of the conservation of mass and the first law of thermodynamics apply to real systems including multiple units, recycle and bypass streams, closed and open systems, and reactive operations. [program outcome e]
- D. The student should be able to utilize the mass and energy balance and thermodynamic data in the analysis of single-phase, multiphase, non-reacting, and reacting systems. [program outcomes a, c, k]
- E. The student should be able to use computational software to solve complex engineering problems and to assess the physical validity of the computational solution. [program outcomes b, k]

**PROGRAM OUTCOMES:** ABET-accredited engineering programs must demonstrate that their graduates have:

- a. an ability to apply knowledge of mathematics, science, and engineering;
- b. an ability to design and conduct experiments, as well as to analyze and interpret data;
- c. an ability to design a system, component, or process to meet desired needs;
- d. an ability to function on multi-disciplinary teams;
- e. an ability to identify, formulate, and solve engineering problems;
- f. an understanding of professional and ethical responsibility;
- g. an ability to communicate effectively;
- h. the broad education necessary to understand the impact of engineering solutions in a global and societal context;
- i. a recognition of the need for, and an ability to, engage in life-long learning;
- j. a knowledge of contemporary issues;
- k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;
- l. an appreciation of diversity issues in society.

\*\*\*look into Sapling developing/adapting MEB online homework question database for use with Murphy textbook. Will need to contact early in spring semester for timely development.

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