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Spring 2020

CHE 240-002: Chemical Process Calculation II

Xianqin Wang

Recommended Citation

Wang, Xianqin, "CHE 240-002: Chemical Process Calculation II" (2020). *Chemical and Materials Engineering Syllabi*. 92.
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Spring 2020 Academic Calendar

January	20	Monday	Martin Luther King, Jr. Day
January	21	Tuesday	First Day of Classes
January	25	Saturday	Saturday Classes Begin
January	31	Friday	Last Day to Add/Drop a Class
January	31	Friday	Last Day for 100% Refund, Full or Partial Withdrawal
February	1	Saturday	W Grades Posted for Course Withdrawals
February	3	Monday	Last Day for 90% Refund, Full or Partial Withdrawal, No Refund for Partial Withdrawal after this date
February	17	Monday	Last Day for 50% Refund, Full Withdrawal
March	9	Monday	Last Day for 25% Refund, Full Withdrawal
March	15	Sunday	Spring Recess Begins - No Classes Scheduled - University Open
March	22	Sunday	Spring Recess Ends
April	6	Monday	Last Day to Withdraw
April	10	Friday	Good Friday - No Classes Scheduled - University Closed
May	5	Tuesday	Friday Classes Meet
May	5	Tuesday	Last Day of Classes
May	6	Wednesday	Reading Day 1
May	7	Thursday	Reading Day 2
May	8	Friday	Final Exams Begin
May	14	Thursday	Final Exams End
May	16	Saturday	Final Grades Due
May	19	Tuesday	Commencement - Undergraduate Ceremonies at Prudential (Tentative)
May	20	Wednesday	Commencement - Graduate Ceremonies at WEC (Tentative)

1. **ChE 240 Chemical Process Calculation II**
   Spring 2020

Session	Time	Days	Where	Date Range	Schedule Type	Instructors
002	1:00 pm - 2:20 pm	WF	Central King Building 303	Jan 21, 2020 - May 5, 2020	Lecture	Xianqin Wang (P)

2. **Credits and contact hours**
   (3-0-2) (Lecture hr/wk-lab hr/wk-course credits)

3. **Course coordinator/instructor/TA**

   Dr. **Xianqin Wang**   **Office Hours**
     Tiernan 360 (office)   Wednesday 11:00AM-12:00PM
     596-5707 (phone)   Friday 10:30AM - 11:30 PM
   xianqin@njit.edu (e-mail)
   (note: you can always make appointment with me by email if the office hour time conflicts with your classes)

ChE240 TA :   ??
   You can consult with TA on questions about the grading of homework assignments, quizzes and/or exams.

4. **Specific course information**

General:

    This course covers the basic principles of energy balances for a variety of engineering systems. Combined with material from other sophomore courses, simple designs of chemical processes are considered. The course also introduces chemical process simulation software.

Pre-requisites: Undergraduate level CHE 210 Minimum Grade of D and Undergraduate level CHE 230 Minimum Grade of D) or (Undergraduate level CHE 210 Minimum Grade of T and Undergraduate level CHE 230 Minimum Grade of T

Textbook   Felder, R. M., Rousseau, R. W., and Bullard, L. G., "Elementary Principles of Chemical Processes", 4th Edition, John Wiley and Sons, New York, New York, 2016

Recommended–
    1) Poling B.E., Prausnits J.M., O'Connell J.P., "The Properties of Gases and Liquids" 5th Edition McGraw-Hill, 2004
    2) Perry, R.H. and Green, D.W. Perry's Chemical Engineers' Handbook, - 9th edition, McGraw-Hill, 2018 or earlier editions
    3) J.M. Smith, Van Ness, Hendrick, Michael Abbott, Mark Swihart, Introduction to Chemical Engineering Thermodynamics, 6th Edition or newer edition, McGraw

Required Software: Latest versions of Matlab, MS Office, Adobe Reader (all can be downloaded from NJIT IST webpage). Student Mall labs and ChE department PC lab have most of the software. Please see Highlander Pipeline for Matlab tutorial and example programs.

5. **Topics**

1) Single phase system properties (Volumetric properties of fluid)

2) Multi-phase system properties (G-L, L-L, L-S systems)
3) Energy balance for open and closed systems (1st law of thermodynamics)
4) Energy balance for non-reactive systems (phase change or solution)
5) Energy balance for reactive systems
6) Materials and energy balance for transient systems (derive differential equation and solve 1st order linear differential equation)

6. Specific course objectives

a. The student will be able to
1) Know basic concepts related to materials and energy balances
2) Draw and label process flowcharts from verbal process descriptions for material balance
3) Write and solve material balance equations for single phase systems and multi-phase systems for both steady-state and transient processes and processes with/without reactions
4) Draw and label process flowcharts from verbal process descriptions for energy calculation;
5) Write and solve energy balance equations based on the 1st law of thermodynamics for both steady and transient processes with /without phase change, or dissolving or absorption, or reactions
6) Use spreadsheets (EXCEL or other software) to solve material and energy balance problems
7) Be professional and responsible in team activities
8) Solve simultaneous materials and energy balance processes, derive differential equation and solve 1st order linear differential equation

b. This course explicitly addresses the following student outcomes: a, d, e, f; (1,4,5)

7. **Grading**

The final grade on a 1000 point basis as follows:

Homework (team work)	100 pts	(10%)
Team project and class workshop	100 pts	(10%)
Quizzes (individual)	100 pts	(10%)
1st term exam (individual)	200 pts	(20%)
2nd term exam (individual)	250 pts	(25%)
Final exam (individual)	250 "	(25%)

Letter grades will be awarded for the following totals:

A	850 and above
B+	800-849 "
B	750-799 "
C+	700-749 "
C	650-699 "
D	550-649 "
F less than	550 "

Before the final exam, those students, who can get above 95% from all homework, all quizzes, all in-class activity and all term exams, can be exempted from final exam.

8. **Policies on assignments/exams and classroom policy**

   Homework policy: Homework assignments will be collected and graded. Homework assignments are the responsibility of the students. You are strongly advised to work on the homework problems because you will <u>NOT</u> learn this material unless you get into the materials **"Hands-on".**

   Quizzes: There will be quizzes occasionally at the beginning of the class. If you miss the class, you will miss the quiz that day. <u>There will be no makeup quiz!</u> **Close book and close notes!**

   In-class group activities policy: Dates of group activities are not announced in advance. Students not being present in class when a group activity (which is to be graded) **starts**, get no credit (zero) for that activity. Each student will be asked at the end of the semester to confidentially rate his/her performance/effort as well as that of all his/her group-mates. This rating will reflect the performance when the members were actually present. Attached is the evaluation form. The completed evaluation form has to be submitted either as a hard copy in a sealed envelope or as a word-file attached to an e-mail to the instructor. Evaluation forms are due on **May 7th 2020. Submission of the form after May 7th 2020 and before the final exam will result to the late submitter getting 75% of the credit that he/she would had received if the form was submitted timely. Submission of the form at the final exam will lead to a further 25% reduction of the credit. No student will be allowed to take the final exam without prior submission of the self & peer evaluation form.**

   Exam policy: There will have two term exams and a comprehensive final exam. All exams are open **textbook**/ **instructor lecture** notes. Graded homework problems **cannot** be used during exams. Additional personal notes on the course (or solutions to additional problems), copies of class notes, as well as copies of the instructor's solutions to homework problems are also **not allowed** to be used during exams. Graded exams will be returned a week after they are taken.

   Policy on exams (other than final): A student must have a compelling reason to miss an exam. Documentation of the reason (e.g., doctor's note) is needed for the instructor to consider giving a make-up exam. A student who cannot make it to an exam needs to either e-mail or call and leave a voice message for the instructor **before** the exam is held. **A single (comprehensive) make-up exam will be given on the reading day (May 6th 2020) for those who have missed mid-term exam for documented/ legitimate reasons.**

   Policy on final exam: The final exam will be based on the entire course material. Students missing the final exam without a documented serious excuse fail the course. Students missing the final exam with a documented serious reason get an Incomplete. The Incomplete will be removed after students take the final exam in Fall 2020 (grade to count towards 40% of the composite). If the course is not offered in Fall 2020, a special make-up final will be scheduled during the Fall 2020 finals week.

   Disputing a grade on tests/assignments: If a student has questions about the grade he/she has received on an exam, homework, or group activity he/she must talk to the instructor (or the teaching assistant where appropriate) **no later than a week after the graded activity has been returned to students. No grade change will be made after the one-week period.**

   Classroom policies: Eating, drinking and the use of telecommunication devices (for any reason, including texting and use as a calculator) are not allowed during class.

9. Tentative Schedule

week	date		tentative content	notes	Homework problems	HW due
week1	1/22/2020	Wednesday	Review Ch.1-5		Ch.5: covered examples	
	1/24/2020	Friday	Review Ch.5			
week2	1/29/2020	Wednesday	Chapter 6		Ch.6: covered examples	Ch.5 HW due
	1/31/2020	Friday	Chapter 6			
week3	2/5/2020	Wednesday	Chapter 6			
	2/7/2020	Friday	Chapter 6			
week4	2/12/2020	Wednesday	Chapter 7		Ch.7: covered examples	Ch.6 HW due
	2/14/2020	Friday	Chapter 7			
week5	2/19/2020	Wednesday	Chapter 7			
	2/21/2020	Friday	Chapter 8		Ch.8: covered examples	Ch.7 HW due
week6	2/26/2020	Wednesday	Chapter 8			
	2/28/2020	Friday	Chapter 8			
week7	3/4/2020	Wednesday	Chapter 8			
	3/6/2020	Friday	1st term exam			
week8	3/11/2020	Wednesday	chapter 9		Ch.9: covered examples	Ch.8 HW due
	3/13/2020	Friday	workshop			
week9	3/18/2020	Wednesday	no class	spring recess		
	3/20/2020	Friday	no class	spring recess		
week10	3/25/2020	Wednesday	Chapter 9			
	3/27/2020	Friday	Chapter 9			
week11	4/1/2020	Wednesday	Chapter 9			
	4/3/2020	Friday	Chapter 9			
week12	4/8/2020	Wednesday	Chapter 9	4/6, last day to withdraw		
	4/10/2020	Friday	no class	Good Friday		
week13	4/15/2020	Wednesday	Chapter 10		Ch.10: covered examples	Ch.9 HW due
	4/17/2020	Friday	Chapter 10			
week14	4/22/2020	Wednesday	Chapter 10			
	4/24/2020	Friday	Chapter 10			
week15	4/29/2020	Wednesday	Chapter 10			
	5/1/2020	Friday	2nd term exam			Ch.10 HW due
week16	5/5/2020	Tuesday	review lecture	Friday class meet		
	5/6/2020	Wednesday	makeup exam	readine day1		
	5/7/2020	Thursday		reading day2	group evaluation due	
	TBD		Final exam			

10. HW assignments

Chapter	Homework problems (Tentatively Covered examples)	HW due
Chapter 5	5.1-1; 5.2-3,5; 5.3-1,3; 5.4-3	1/29/2020
Chapter 6	6.1-1; 6.2-1; 6.3-2,3; 6.4-2,3,4,5; 6.5-1, 2, 3, 4; 6.6-1,2; 6.7-1	2/12/2020
Chapter 7	7.3-1; 7.4-1,2; 7.5-1,2,3; 7.6-1,2,3; 7.7-1,2,3	2/21/2020
Chapter 8	8.1-1; 8.3-2, 3, 4, 5, 6; 8.4-4, 5, 6, 7; 8.5-1, 2, 3, 4, 5	3/11/2020
Chapter 9	9.1-1; 9.2-1; 9.4-1; 9.5-1, 2, 3, 4, 5, 6; 9.6-1, 2, 3	4/15/2020
Chapter 10	10.1-1,2; 10.2-1,2; 10.3-1,2; 10.4-1	5/1/2020