

## **Phase and Chemical Equilibria**

ECH 4123 Class No. 11571 Section 7320

**Class Periods:** MWF, Period 5 (2:00 PM – 3:15 PM)

**Location:** Online

**Academic Term:** Summer C 2020

### **Instructor:**

**VJ Tocco**

I prefer that you call me “VJ”, but you may also call me “Dr. Tocco” if you are more comfortable addressing your instructors formally.

**E-Mail:** [vjtocco@ufl.edu](mailto:vjtocco@ufl.edu)

**Office:** 322 Black Hall

**Office Hours:** by appointment, via Zoom

### **Supervised Teaching Student:**

None

### **Exam Dates (tentative and subject to change)**

Midterm Exam: Week of June 15

Final Exam: Week of August 10 (last week of semester)

### **Course Description**

Application of thermodynamic principles to systems of variable composition including the study of phase and chemical equilibria.

### **Course Pre-Requisites / Co-Requisites**

**Pre-requisites:** ECH3101 (Process Thermodynamics), ECH3202 (Fluid and Solid Operations) and ECH3223 (Energy Transfer Operations)

### **Course Objectives**

- To teach the concepts of thermodynamic phase and chemical equilibria.
- To teach how to evaluate chemical potentials and fugacities in pure components and mixtures.
- To apply thermodynamic phase and chemical equilibrium theory to liquid-liquid, vapor-liquid, and solid-liquid systems.
- To effectively utilize UniSim, a process simulation software packages

### **Materials and Supply Fees**

None

### **Professional Component (ABET):**

This course will significantly contribute in achieving B.S. program outcomes 1 (An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics) and 7 (An ability to acquire and apply new knowledge as needed, using appropriate learning strategies).

### **Textbooks**

**Required:** *Chemical, Biochemical, and Engineering Thermodynamics*, 4<sup>th</sup> Ed., by Stanley I. Sandler  
ISBN: 978-0471661740

**Recommended:** Fundamentals of Chemical Engineering Thermodynamics, by Dahm and Visco  
ISBN: 978-1111580704

### **Required Materials**

A computer (laptop or desktop) is required for coursework. A webcam and stable internet connection is required for exams and helpful for synchronous online meetings.

### **Required Software**

Unisim software is a required portion of this course, which requires the Windows operating system. Installation walk-throughs will be provided during the first week of class.

University of Florida students are able to use this software free of cost via academic licenses, although this requires access to the University of Florida network. Information about connecting remotely may be found at the following URL: <https://it.ufl.edu/ict/documentation/network-infrastructure/vpn/>

### **Course Schedule**

Note that this is a rough estimate, and subject to change considerably, based on the needs of the class

<b>Week</b>	<b>Begins</b>	<b>Topic(s)</b>
<b>1</b>	5/11	Course Introduction and Review
<b>2</b>	5/18	Equilibrium, Stability, and Equations of State
<b>3</b>	5/25	Single-Component Systems
<b>4</b>	6/1	Mixture Functions
<b>5</b>	6/8	Ideal Mixtures
<b>6</b>	6/15	Excess Property and Activity
		SUMMER BREAK
<b>7</b>	7/6	Vapor-Liquid Equilibrium
<b>8</b>	7/13	Non-Ideal Mixtures
<b>9</b>	7/20	Non-Ideal Mixtures (Cont.)
<b>10</b>	7/27	Colligative Properties
<b>11</b>	8/3	Reaction Equilibria
<b>12</b>	8/20	Review and Conclusion

### **Course Structure, Attendance Policy, and Make-Up Work**

This course will be taught in an asynchronous format, meaning the core content delivery will be recorded as screen-casts and posted to Canvas.

This method has a key advantage over synchronous (real-time) courses: The ability to pause, rewind, and work at your own pace should greatly enhance your understanding, particularly since the nature of the material is quite theoretical and frustrating if you get lost.

The main drawback of this method is the lack of interaction and discussion. To alleviate this disadvantage, one or two synchronous sessions will be scheduled each week (via Zoom) as a supplement. Attendance is not required, but strongly encouraged.

Make-up work/assignment extensions will be offered if (and only if) you notify the instructor in advance of your absence via email, your reason for absence is consistent with the UF attendance policy (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>), and you provide the appropriate documentation.

### **Excused absence work make-up**

Make-up work will be considered on a case-by-case basis, commensurate with your circumstances in a manner that is fair to you and your classmates. **There will be no make-up assignments for unexcused absences.**

### ***Evaluation of Grades/Course Assignments***

<b>Assignment</b>	<b>Percentage of Final Grade</b>
Homework Sets	20%
Reading Quizzes	20%
Midterm Exam	30%
Final Exam	30%

An overall grade of 90% is worth at least an A-; of 80% a B-, or 70% a C-, of 60% a D-. These thresholds may be shifted slightly downward based on the difficulty of the assignments and the grading criteria, but will never be shifted upward. The exact letter grading criteria will be determined at the end of the semester.

#### **Homework: 20%**

Homework will be assigned approximately once per week. Your solution should mirror a typical textbook solution, with complete sentences to explain your logic and equations to supplement these explanations.

The grading basis will vary: sometimes problems will be scored for correctness, other times for completion/neatness. The grading basis may, or may not, be announced prior to the due date (but will be made available on Canvas).

#### **Reading Quizzes: 20%**

These are multiple-choice, fill-in-the-blank or short answer quizzes, designed to make sure you stay current with course material. Partial credit will be awarded for attempt.

#### **Exams (30% each):**

Exam format is to be determined later, subject to the logistical needs of the class. The midterm will be held the week before the summer break, and the final will be held during the last week of the semester.

#### **Extra Credit: 1% Possible**

Option 1: Write an original exam/homework question. You must submit the **question statement, an answer key, and an explanation of the concept** that the question is testing. In addition, by submitting these questions, you authorize me to use them in subsequent semesters (or, if the question is good enough, this semester!).

Option 2: Submit a creative expression of your experiences in ECH4123. Submissions may include a song, video, poem, craft, artwork, or any other creation. The only constraints are that your

submission must be completely original, and your submission must be **shared** with the rest of the class on the last day of class.

The deadline to turn in extra-credit is **Monday, August 20, 2020**.

More information on UF grading policy may be found at:  
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### ***Regrades:***

To submit a regrade, fill out the regrade request form (a blank copy may be found on Canvas). This form will require you to directly state the number of points you think you deserve and a full explanation of the discrepancy (unless it is a simple addition error). **Do not write anything directly on any page of your assignment.** You must scan and upload your entire assignment, with the regrade request as the cover page to Canvas within **one week** of the date the assignment was returned to the class.

### ***Students Requiring Accommodations***

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***Software Use***

***ECH4123: Phase and Chemical Equilibria  
Tocco, Summer C 2020***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### ***Campus Resources:***

#### *Health and Wellness*

##### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

##### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

##### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

#### *Academic Resources*

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.