Safety Basis of Chemical Engineering

ECH6937 Class Number 28238
Class Periods: M,W,F | Period 5 (11:45 AM - 12:35 PM)
Location: On-line
Academic Term: Spring 2021

Instructor:
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392-6207
Office Hours: TBD

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
N/A

Course Description
3 credit hours. Separations processes, reactor design, applied molecular and kinetic theory, thermodynamics, particulate systems. Properties of chemical substances, transport phenomena, non-Newtonian fluid dynamics, turbulence, applied mathematics, computer science, biochemical and electrochemical engineering.

Course Pre-Requisites / Co-Requisites
Chemical Engineering graduate student standing.

Course Objectives
The objective of this course is to build an understanding of how chemical engineering science and principles may be used to recognize and mitigate hazards in the chemical process industry. The lectures are based partly on a textbook that is a standard for chemical process safety education. Other material will be drawn from incident investigations published by the Chemical Safety Board (CSB) and the National Transportation and Safety Board (NTSB). The class will also draw on computer program resources provided by the National Oceanic and Atmospheric Administration (NOAA). Guest speakers will provide valuable perspective on safety in industry. The course will also encourage completion of safety certification administered by Safety and Chemical Engineering Education (SAChE). These certificates serve to complement the content of the course and to enhance the students' resumes.

Materials and Supply Fees
On-line Course Fees: $24.99
The other expected expenditures are AIChE membership ($50/year for graduate students) and a used copy of the third edition of Crowl and Louvar.

Required Textbooks and Software
Daniel A. Crowl and Joseph F. Louvar, *Chemical Process Safety: Fundamentals with Applications*, 3rd edition, Prentice-Hall, Upper Saddle River, NJ, 2011. ISBN-13: 9780131382268.
Note: Exams will be open-book, and use of computers and phones will be prohibited. Thus, a paper copy of the book will be required. Other materials will be made available on the course website.

Software
We will make use of free programs (ALOHA, MARPLOT, CAMEO Chemicals) from the National Oceanic and Atmospheric Administration (NOAA).
https://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/response-tools/cameo-software-suite.html
and CRW4 downloadable from the AIChE.
https://www.aiche.org/ccps/resources/downloadinstall

Honorlock

We will use Honorlock for exams. You will need a laptop or desktop computer. If your computer doesn't include a built-in webcam and microphone, you will also need to attach a webcam and a microphone. You will need the Google Chrome browser and a one-time installation of a Chrome browser extension for Honorlock. You will also need a stable and strong Internet connection. Please test your system in advance via a link on the Honorlock support page.

Recommended Materials

As the course represents the synthesis of chemical engineering courses taken to date, e.g., material and energy balances, transport phenomena, fluid and solids operations, and thermodynamics, students are advised to refer to textbooks used in those classes as needed.

Course Schedule

The tentative schedule for exams and materials covered is appended.

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Attendance Policy, Class Expectations, and Make-Up Policy

State whether attendance is required and if so, how will it be monitored? What are the penalties for absence, tardiness, cell phone policy, laptop policy, etc. What are the arrangements for missed homework, missed quizzes, and missed exams? This statement is required: Excused absences must be in compliance with university policies in the Graduate Catalog (http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance) and require appropriate documentation.

Evaluation of Grades

Grades are based on exams, completion of homework assignments, attendance, and participation in the class.

Homework and quizzes	10%
SAChE certification (5)	20%
Mid-term exams (2)	40%
Final exam	30%

All students are required to complete the SAChE Chemical Reactivity Hazard certificate. Credit is given for completion of 4 additional Level Two and Level Three SACHE certification.
The SACHE certification is free to AIChE student members. For graduate students, the cost of membership is $50/year. https://www.aiche.org/students/membership Please confirm your membership as soon as possible to avoid unforeseen problems later in the semester.

Grading Policy

Grades for this class are curved at the discretion of the instructor. Attendance and class participation will be considered.

More information on UF grading policy may be found at:
http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

Students Requiring Accommodations
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, 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
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use
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 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

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 suppor*t*, 352-392-4357 (select option 2) or e-mail to 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://care.dso.ufl.edu.

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

Tentative Schedule (updated January 11, 2021)

Date	Topics Covered
Jan. 11, 2021	Introduction to Course. Explosion at T2 Laboratories, Jacksonville. Expectations.
Jan. 13, 2021	(Chapter 1) Inherent safety, accident and loss statistics, acceptable risk, public perceptions, the nature of the accident process.
Jan. 15, 2021	(Chapter 2) Toxicology.
Jan. 18, 2021	UF Holiday. Martin Luther King Day.
Jan. 20, 2021	Chapter 2 continued. Dose and Response Curves. Threshold Limit Values.
Jan. 22, 2021	Chapter 3. Industrial Hygiene. OSHA, PSM.
Jan. 25, 2021	(Chapter 3 continued. EPA, RMP. TLV calculations.
Jan. 27, 2021	(Chapter 3) Ventilation calculations.
Jan. 29, 2021	(Chapter 3) Safety Data Sheets.
Feb. 1, 2021	Chapter 3. Ventilation.
Feb. 3, 2021	
Feb. 5, 2021	Laboratory Safety
Feb. 8, 2021	(Chapter 4) Source Models. Liquids, gases. Release of gases, choked flow.
Feb. 10, 2021	
Feb. 12, 2021	(Chapter 4) Compressible flow
Feb. 15, 2021	(Chapter 4) Compressible flow. Flashing. Liquid pool evaporation, realistic and worst case releases.
Feb. 17, 2021	(Chapter 4) Compressible flow. Graphical methods.
Feb. 19, 2021	(Chapter 4) Flashing. Liquid pool evaporation, realistic and worst case releases.
Feb. 22, 2021	(Chapter 5) Toxic Release and Dispersion Models. Fundamental approach.
Feb. 24, 2021	
Feb. 26, 2021	(Chapter 5) Chapter 5 turbulence in neutrally buoyant dispersion models
Mar. 1, 2021	(Chapter 6) Chapter 5 Pasquill-Gifford model
Mar. 3, 2021	(Chapters 6) Chapter 5 Examples 5.1 and 5.2
Mar. 5, 2021	Chapter 5 Dense gas dispersions
Mar. 8, 2021	Chapter 5 Toxic effect criteria. Chapter 6 Fire triangle
Mar. 10, 2021	
Mar. 12, 2021	Chapter 6 Intro to flammability diagrams
Mar. 15, 2021	Video: Piper Alpha
Mar. 17, 2021	Using Flammability diagrams
Mar. 19, 2021	Fire and Explosions 1
Mar. 22, 2021	Fire and Explosions 2
Mar. 24, 2021	No class. Spring Recharge Day
Mar. 26, 2021	Q/A. Dust explosions.
Mar. 29, 2021	Dust explosions. Use of NOAA emergency response programs.
Mar. 31, 2021	Review**.**
Apr. 2, 2021	(Chapter 11) Hazard Identification
Apr. 5, 2021	(Chapter 12) Risk Assessment.
Apr. 7, 2021	
Apr. 9, 2021	

Apr. 12, 2021	(Chapter 8) Chemical Reactivity.
Apr. 14, 2021	Revealed and unrevealed faults, Event trees, QRA, LOPA
Apr. 16, 2021	(Chapter 13) Safety Procedures and Best Practices
Apr. 19, 2021	
Apr. 21, 2021	Review
Apr. 30, 2021	**Final Exam (7:30–9:30 am)**

Guest Speakers

Jeffrey Wanko	Director, Office of Chemical Process Safety and Enforcement Initiatives, OSHA, Washington, DC. Jeff previously was an investigator with the Chemical Safety Board.
Frank Tagliarini	Production Manager, Bacardi, Jacksonville, Florida. Frank is a graduate from the University of Florida and worked with Busch Theme Parks, Anheuser-Busch, and Bacardi. He served 24+ years with the U.S. Navy Reserves.
Kevin Kennelley	CEO, Kennelley & Associates Oil & Gas Consulting. Kevin was Vice President for BP and for Maersk Oil and Gas.

Exams

Midterm	Exams will be scheduled
Final	Apr. 30, 2021, 7:30–9:30 am