

## Advanced Chemical and Biological Process Laboratories

ECH 6937

*Academic Term:* Spring 2023

### *Class Meetings*

- **Lab Sessions:**
  - Section 12003: Tuesdays, periods 6-9 (12:50 pm – 4:55 pm) and
  - Section 19585: Thursdays, periods 6-9 (12:50 pm – 4:55 pm)
  - Location: **CHE 220 and CHE 300A**
- **Lectures:**
  - Wednesdays, period 3 (9:35 AM – 10:25 AM) - **CHE316**

### *Instructor*

Sumant Patankar

Email Address: [spatankar@ufl.edu](mailto:spatankar@ufl.edu)

Office Phone Number: (352) 392-0862

Office Location: CHE 223

Office hours: Wednesdays, 11:30 am – 12:30 pm CHE 223 or [zoom](#)

### *Course Description*

3 credit hours. This is a laboratory course providing an overview of advanced chemical and biological processing techniques. Students taking this course will gain hands-on experience in performing experiments and will improve their report writing and oral presentation skills.

### *Experimental Modules*

- Process control
- Gas Absorption
- Cooling tower
- Hydrogen fuel cell
- CRISPR
- PCR and DNA electrophoresis

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

None.

### *Course Objectives*

- Reinforce classroom theory by collection and use of data in practical experiments with all their inherent problems and limitations.
- Gain hands-on experience in performing experiments for a wide range of Chemical and Biological processes.
- Learn and practice safe laboratory techniques and operating procedures.
- Gain experience in analysis and interpretation of experimental data.
- Improve problem-solving skills.
- Apply critical thinking skills to analysis of problems and cause-effect relationships.
- Gain experience in working in teams.
- Gain proficiency in writing technical reports.
- Gain experience in giving oral presentation, including handling of questions and use of appropriate visual aids.

- Create a sense of professional responsibility for the quality and integrity of engineering work.

### ***Materials and Supply Fees***

The material and supply fees are included in the credit fee. The total credit fee (for 3 credits) is \$2250.

### ***Required Textbooks and Software***

None. The lab manuals and protocols of the experimental modules are available through Canvas. It is the student's responsibility to let the instructor know if they have problems accessing the material.

### ***Recommended Materials***

The students are encouraged to check all the resources referenced in the lab manuals and protocols from the libraries or the Internet. Note that most journal articles can be downloaded from a computer connected to the University network.

### ***Course Schedule***

Students will work in groups of two or three to perform laboratory experiments for 4 hours once a week. Each group will consist of two students. If necessary, additional lab sessions will be scheduled to accommodate all groups. The group assignments and the experiment schedule will be posted on Canvas.

### ***Online Course Recording***

Our online 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.

Student presentations will be recorded for grading purposes. The presentation recordings will be handled using the same privacy rules as other submitted assignments. In particular, they will not be shared with other students.

### ***Attendance Policy, Class Expectations, and Make-Up Policy***

- A student must be in attendance for the entire lab period of every module. Excused absences must be consistent with [university policies](#) and require appropriate documentation. The students will be required to make up a missed lab. An unexcused absence will result in **zero points** for the missed module.
- Students will be given a warning for the first tardiness. Each subsequent instance of tardiness will result in a **half letter-grade reduction**.
- Cell phones cannot be used in the lab.

### ***Evaluation of Grades***

The grade will be determined according to the following weighting criteria:

- Lab reports: 30%
- Presentations: 30%
- Postlab homework: 20%
- Prelab homework: 10 %
- Quizzes: 5 %
- Participation: 5 %

The participation grade will be based on the instructor's observations. **A failing grade for participation will result in a failing course grade.**

**Important:** Failure to follow safe operating procedures will result in a substantial grade reduction.

### **Grading Policy**

The final grading scale will be curved as appropriate.

<b>Percent</b>	<b>Grade</b>	<b>Grade points</b>
90.0 - 100	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 77.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

### **Safety**

The students are expected to know and follow safe operating procedures of the equipment as well as proper handling of hazardous materials. The students are required to attend a safety orientation session at the beginning of the semester. **Failure to follow safe operating procedures will result in a significant grade reduction.** Examples of safety violations are listed below (this list is not exhaustive):

<b>Safety violation</b>	<b>Penalty</b>
Leaving the lab without shutting down an experimental system	Failing grade
Not wearing PPE required by an experiment	Letter grade reduction
Not disposing of hazardous waste properly	Letter grade reduction
Not handling a chemical spill properly	Letter grade reduction
Bringing food or drink into the lab	Letter grade reduction

### **Prelab Homework Policy**

- **Prelab homework should be completed individually** by each student and is due at the beginning of each new experiment.
- **A failing grade will be assigned to students whose cumulative prelab homework grade is less than 50%.**
- In addition to the homework assignment for each specific experiment, in the beginning of the semester the students will be assigned a homework on safety (due before your 1<sup>st</sup> lab session).
- Late homework submissions will be accepted only if a student was not able to complete the homework on time due to an acceptable reason (see the attendance policy).

### **Quiz Policy**

- A short quiz will be given at the beginning of each lab session.
- **A failing grade will be assigned to students whose cumulative quiz grade is less than 50%.**
- **Failure to correctly answer safety-related questions will result in a 5% reduction of the course grade per each wrong answer.**

- Quizzes will be rescheduled only for those students who missed them due to an acceptable reason (see the attendance policy). It is required that whenever possible the student notifies the instructor about the situation before the quiz.
- Students arriving late for a quiz will be given only the balance of time remaining to complete their work unless an acceptable reason (see above) is provided.
- **Students may not use their notes, manuals, or any other material during the quizzes.**

## ***Schedule for each experiment***

### **Before the experiment:**

1. Review theory, safety rules, operating instructions, and instructional videos posted on the Canvas website.
2. Answer pre-lab questions posted on the Canvas website. Written answers to the pre-lab questions should be uploaded to Canvas before the lab session.

### **During the experiment:**

1. Take the pre-lab quiz.
2. Answer any additional questions from the instructor regarding the goals of the experiment, the operating procedures, and the safety hazards.
3. Complete a pre-lab checklist.
4. Follow the manual and the instructional videos to perform the experiments.
5. Learn about limits of the system.
6. Experiment with the system under various conditions.
7. Perform basic checks of your data (e.g., mass and energy balances) during the experiment. Avoid a situation in which you collect data just to discover that it does not satisfy the mass or energy balance **after** you are out of the lab and writing your report. It is necessary to perform the basic checks **during** the lab and repeat an experiment, if necessary.
8. Your preliminary analysis will be reviewed by the instructor and will contribute to your lab participation grade.
9. Properly shut-down the equipment, dispose of waste, and clean the work area.
10. Complete a post-lab checklist.

### **After the experiment:**

Analyze your data and work on your post-lab assignment. Each module has one of the following post-lab assignments:

- Oral presentation (two of the lab modules)
- Lab report (two other lab modules)
- Post-lab homework (all other lab modules).

Specific assignments for each module will be communicated through Canvas. Unless stated otherwise, all reports, presentations, and postlab homeworks are group assignments. Postlab homeworks are **due one week after the experiments** whereas reports and presentations are **due two weeks after the experiment**. Specific times for presentations will be announced on Canvas.

Reports and presentations will be graded both on technical content and communication effectiveness. Grading rubrics for the reports and presentations will be posted on the Canvas website. Students are encouraged to submit drafts of their reports and presentation slides to the instructor for feedback before submitting the final version for a grade. The drafts should be submitted at least one week before the final submission deadline to ensure timely feedback from the instructor.

### **Submission of post-lab assignments:**

1. All written post-lab assignments should be submitted via Canvas either in MS Word or PDF format.
2. Slides for oral presentations should be submitted via Canvas either in PowerPoint or PDF format.
3. In addition to a report, post-lab, or presentation file, your submission should contain all supporting information, such as spreadsheet files with raw data and files with your computer codes. However, your reports and presentations should be self-contained, i.e. one should be able to understand your work by reading your report or listening to your presentation without referring to supporting materials.

### ***Guidelines for Experiments and Data Analysis***

1. Always perform basic validity checks, such as energy and material balances.
2. Investigate effects of all control parameters on the experimental results.
3. Clearly identify and justify all assumptions in your theoretical calculations.
4. Compare the measured data with your theoretical calculations.
5. Check reproducibility of your data. Whenever possible, **perform at least three runs for each experimental condition** and obtain error estimates by computing standard deviations based on these runs.
6. Report any anomalous results and discuss their possible sources.
7. Use spreadsheets (e.g., Excel or OpenOffice) to store your data. Use python, matlab, or another equivalent programming language for data analysis and theoretical calculations. Use of spreadsheets for complex calculations is discouraged due to difficulty of their debugging.
8. Make sure that your objectives can be met with your operating conditions. It is easy to choose conditions that are outside of the performance limits of the apparatus or produce results with no measurable difference.

### ***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.

### ***Cooperation Policy***

- Students are expected to work in teams on their experiments and group post-lab assignments.
- Pre-lab questions and the introductory post-lab assignment should be answered by each student individually.
- No consultation among students is allowed during quizzes.

### ***Plagiarism***

Students are not permitted to represent as their own work any portion of the work of another person. Plagiarism includes (but is not limited to) submitting a document or assignment which in whole or in part is identical or substantially identical to a document or assignment not authored by the student. **All sources used in preparation of reports and presentations should be cited.** All submitted assignments will be subjected to the Turnitin software to determine their originality.

### ***Falsified Information***

Students are not permitted to use or report any invented or fabricated information or data. This includes both experimental results and theoretical calculations.

### ***Sanctions***

Since ethical behavior in science and engineering is equal in importance to specific knowledge, violations of the honor code will result in a substantial grade reduction. For the first violation, **the grade for the assignment will be reduced by at least 50%**. For the second violation, violators will be assigned a **non-passing letter grade** for the course.

### ***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/>.

### ***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***

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](mailto:title-ix@ufl.edu), 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>.