

Electrochemistry and Stability of Materials

EMA 4324 Class #12765

Class Periods: MWF 8 (3:00 – 3:50pm)

Location: Florida Gym 220

Academic Term: Fall 2024

Instructor:

Prof. Simon Phillpot

sphil@mse.ufl.edu

352 846-3782

Office Hours: M 10:40 – 11:30 Rhines 164 (and other times by appointment)

Supervised Teaching Student:

Please contact through the Canvas website

Course Description

Stability, corrosion, and electrochemical processes in materials. Topics covered include degradation of materials, electrochemical thermodynamics, electrochemical kinetics, electrochemical systems, and industrial electrochemical processes.

Course Pre-Requisites / Co-Requisites

EMA 4314

Course Objectives

- To develop an understanding of degradation processes in a range of materials systems
- To develop a qualitative and quantitative understanding of the thermodynamics and kinetics of electrochemical processes in materials
- To develop an understanding of aqueous corrosion and high-temperature oxidation processes
- To develop an understanding of physical and chemical processes in electrochemical energy systems, including representative contemporary technologies

Materials and Supply Fees

None

Professional Component (ABET):

3 credits of engineering topics.

Relation to Program Outcomes (ABET):

The table below is an example. Please consult with your department's ABET coordinator when filling this out.

Outcome	Coverage*
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and	

welfare, as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Medium
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- Electrochemical Energy Storage
Petrovic, Kurzweil and Garche
2022, 1st Edition, e-book
https://ufl-flvc.primo.exlibrisgroup.com/permalink/01FALSC_UFL/175ga98/alma99384005276906597
- Principles and Prevention of Corrosion
Denny A. Jones
1996, 2nd Edition
ISBN 0-13-359993-0

Recommended Materials

- Corrosion Engineering: Principles and Solved Problems
Branko N. Popov
2015, 1st Edition
ISBN 978-0-444-62722-3

You will also find your thermodynamics book (DeHoff; Atkins, Physical Chemistry or similar) useful, particularly in the early part of the course.

Required Computer

UF student computing requirement: <https://news.it.ufl.edu/education/student-computing-requirements-for-uf/>

Course Schedule

Tentative exam dates are

Exam 1: Friday 20th September

Exam 2: Friday 25th October

Exam 3: Wednesday 4th December (Last Day of Class)

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is **strongly** encouraged as we will have multiple graded in-class activities; some may be announced in advance in class, others may not. Cell phones should be turned off, or muted, prior to the start of class. Reading of newspapers, work on assignments for this or other classes, or other activities that are not part of the class are not allowed during lecture. Students who do not comply with these requirements or who behave disrespectfully or in a disorderly manner may be asked to leave the classroom and will not be allowed to make up quizzes or other assignments. It is acceptable to work together on HW; however, all solutions submitted must be the work of the student and may not be copied from another student or other resource. Late HW will be accepted after the deadline and until the solutions are posted, with the overall score reduced by 30%. No HW will be accepted after the solutions are posted. There will be multiple in-class activities (hands-on activities, guided problem solving, quizzes, ...) with two (absent or lowest score) to be dropped from the in-class activity score; make-ups will only be available with excused absences. Missed exams will be scored as zeros unless an excused absence has been given by the instructor prior to the exam. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (~10; drop 1)	10*	25%
In-class activities (drop 1)	Up to 10	15%
First Exam	100	15%
Second Exam	100	15%
Third Exam	100	15%
Report(s)	10	15%
		100%

* Each HW problem or appropriate part of problem will be given a score between 0 and 4: 4 (correct or essentially correct; A quality work); 3 (very substantially correct; B quality work); 2 (largely correct; C quality work); 1 (some progress made; D quality work); 0 (minimal progress or question not attempted; E quality work). Score for the entire HW will be scaled to 10, so each HW set counts equally.

Grading Policy

Percent	Grade	Grade Points
92 - 100	A	4.00
88 – 91.9	A-	3.67
84 – 87.9	B+	3.33
80 – 83.9	B	3.00
76 – 79.9	B-	2.67
72 – 75.9	C+	2.33
68 – 71.9	C	2.00
65 – 67.9	C-	1.67
62 – 64.9	D+	1.33
59 – 61.9	D	1.00
56 – 58.9	D-	0.67
0 – 55.9	E	0.00

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

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/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

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/process/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 varied perspectives and lived experiences within our community and is committed to supporting the University’s core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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 Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@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: <https://counseling.ufl.edu>, 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 support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://elearning.ufl.edu/>.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.