

## Corrosion in Nuclear Power Plants

ENU 6937 Section 2E13

**Class Periods:** W 3-4; F 3

**Location:** DAU 342

**Academic Term:** Spring 2018

### **Instructor:**

Yong Yang

[yongyang@ufl.edu](mailto:yongyang@ufl.edu)

352-846-3791

Office Hours: Walk-in or appointment by email

### **Teaching Assistants:**

Please contact through the Canvas website

- N/A

### **Course Description**

The course covers discussion in the corrosion and related stress corrosion cracking behaviors of structural materials in nuclear power plants. Topics covered include the mechanisms, energetics and kinetics of corrosions, prevention and mitigation strategies. The reactor environments surveyed include LWR, molten salts, liquid metals and high temperature gases.

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

None

### **Course Objectives**

To develop an understanding of corrosion mechanisms that drive the materials degradations in a nuclear power plants, to be able to identify the contemporary issues and how to go about understanding degradation mechanisms, mitigation, etc.

### **Materials and Supply Fees**

None.

### **Required Textbooks and Software**

None, the course notes will be provided on Canvas.

### **Recommended Materials**

- Principles and prevention of corrosion, 2<sup>nd</sup> edition
  - Author: Denny A. Jones
  - Publication: Prentice Hall, 1996
  - ISBN: 0-13-359993-0
- Corrosion Engineering
  - Author: Branko N. Popov
  - Publication: Elsevier
  - ISBN:978-0-444-62722-3

### **Course Schedule**

Week 1: Introduction of Corrosion and Stability of Materials

Week 2: Thermodynamics in the Electrochemical Reactions of Corrosion

Week 3: Electrochemical kinetics of corrosion

Week 4: Passivity

Week 5: Galvanic corrosion, pitting and crevice corrosion

Week 6:	Hydrogen permeation and hydrogen-induced cracking
Week 7:	Stress corrosion cracking
Week 8:	Corrosion prevention, inhibitors and cathodic protection
Week 9:	Corrosion in LWR environment
Week 10:	Irradiation assisted stress corrosion cracking
Week 11:	Corrosion in supercritical water
Week 12:	Corrosion and oxidation in high temperature gas
Week 13:	Corrosion reaction in molten salt
Week 14:	Corrosion and erosion in liquid metals
Week 15:	Corrosion behaviors of fuel storage and repository
Week 16:	Lab modules of static corrosion autoclaves

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

All students are expected to attend class, and Excused absences are consistent with university policies in the undergraduate catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation. Cell phones and other electronic devices must be completely silent in class. Activities that are not part of the class are not allowed during class time.

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

Assignment	Total Points	Percentage of Final Grade
Homeworks	100 each	30%
Midterm exam	100 each	30%
Final project and presentation	100 each	40%
		100%

### ***Grading Policy***

Percent	Grade	Grade Points
90.0 - 100.0	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 - 79.9	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

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 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***

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Spring 2016*

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/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://www.dso.ufl.edu/sccr/process/student-conduct-honor-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.

### ***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: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

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

#### ***Health and Wellness***

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

If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) or 352 392-1575 so that a team member can reach out to the student.

**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 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>.