Course Syllabus
EMA 4324, Stability of Materials
Section 3009, Fall 2014

1. Course Description – This is an undergraduate course in degradation and stability of materials. Topics covered include the mechanisms, energetics and kinetics of environmental degradation of materials as well as the economic impact, prevention and mitigation strategies, and contemporary issues (3 credit hours).

2. Pre-requisites and Co-requisites – EMA 4314.

3. Course Objectives Include:
   a. to develop an understanding of environmental conditions and degradation mechanisms that drive the deterioration of engineering materials and what is necessary for prevention or control;
   b. to become familiar with traditional terminology, conventions and sources of materials degradation;
   c. to be able to identify contemporary issues in environmental degradation of materials and how to go about understanding degradation mechanisms, rates, control, etc. in these novel problems;
   d. to develop an understanding of the environmental and economic impact of materials and their degradation throughout their life cycle;

4. Instructor – Rajiv K. Singh
   a. Office location: 178 Rhines
   b. Telephone: 352-392 1032
   c. E-mail address: rsing@mse.ufl.edu
   d. Course website: http://lss.at.ufl.edu (e-learning)
   e. Office hours: regular times TBD, based on undergraduate and lecturer schedules and by appointment (email a request).

5. Teaching Assistant – Aksay Rajopadhye
   a. Office location: TBA
   b. E-mail address: TBA
   c. Office hours: TBA

6. Meeting Times – MWF, Period 7 (1.55 PM – 2.45 pm).

7. Meeting Location – WEIM 1084.

8. Final Exam- Dec 10

9. Textbook Required –
   a. Title: Principles and Prevention of Corrosion, 2nd edition
   b. Author: Denny A. Jones
   c. Publication: Prentice Hall, 1996
   d. ISBN: 0-13-359993-0

10. Other Reading Materials and Resources –
    a. "Handbook of Environmental Degradation of Materials," by Myer Kutz; William Andrew Publ. (2005).
    b. "Principles of Corrosion Engineering and Corrosion Control," by Zaki Ahmad; Elsevier (2006).
    c. Various handouts throughout the course.

11. Attendance and Professional Expectations – Attendance is ***strongly*** encouraged. Attendance will inevitably be reflected in the course grade through previously unannounced quizzes administered during the lecture period. Cell phones, PDAs, etc., should be turned off 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 disorderly or disrespectfully may be asked to leave the classroom and will not be allowed to make up quizzes or other assignments.

12. Grading –
    a. 20 %: Homework, all assignments equally weighted

b. 60 %: 3 Exams
c. 20 %: Contemporary issue lecture (see below)

Homework assignments are due at the beginning of class on the date listed on the course outline and are to be handed in to the instructor..

There will be 2 mid term and 1 comprehensive final exam for this course. Exams are NOT "open book" unless explicitly designated as such. Students are allowed to hand-write 1 page (front and back) of equations and constants only. Calculators and rulers are allowed and encouraged. Unless prior written approval has been granted by the instructor, no make-up exams will be allowed; students not in attendance for the scheduled exam time and place will receive a score of zero. Make-up exams will only be allowed in exceptional cases with sufficient documentation and in accordance with University policies.

Contemporary Issues: The field of Stability of Materials is undergoing a transformation in topical coverage and breadth, leading to increasingly new applications and expanding fundamental scientific principles. This course, historically rooted in metallic corrosion in aqueous environments, will evolve with this transformation. To incorporate these contemporary issues into the classroom, each student will choose a contemporary issue topic that will be approved by the instructor. Students will then perform literature and/or other research on the topic and develop a contemporary issues presentation/lecture (50 minutes). Students will work in teams that will be assigned by the instructor. Lectures will be scheduled near the end of the term. Potential scheduling conflicts with the presentation must be discussed with the instructor within the first 5 days of the semester.

20% of the total course grade is allotted to these activities and will be divided between the paper and presentation in the following manner:

- 10% of the grade will be assigned based on pre-prepared materials (e.g presentation materials and review paper etc..) that should be provided to the instructor at least 1 business day in advance of the presentation; all team members will receive the same grade.
- 10% of the grade will be assigned based on the quality of the presentation/lecture; all team members will receive the same grade. Multiple members can make the presentation
- Each participant will be evaluated by their team peers with respect to their contribution to the project. The sum of the above (10%+10%) will be weighted with respect to this peer evaluation. For example, if a student receives an average of a 90% rating by their team peers, and the team receives a 8% and 9% on the two previous components, their individual score will be calculated as: (8+9)*(0.9) = 15.3 out of 20 points. Upon request, the instructor may show the average peer evaluation rating to a student but will not show the individual evaluations. The instructor reserves the right to override the peer evaluations if necessary.

The participants benefit from these activity in the following ways: 1) each student can specialize according to their interests or materials specialty while still enabling a broadening of the topics presented during lecture for all students, 2) students are encouraged to independently identify engineering problems, 3) students learn to communicate effectively, 4) students learn tools to engage in lifelong learning, and 5) students develop a knowledge of contemporary issues – both through direct involvement and from subsequent contemporary issues lectures.

13. Grading Scale -

Percentage	≥92	≥88	≥84	≥80	≥76	≥72	≥68	≥65	≥62	≥59	≥56	<56
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0

(Grade percentages containing decimals will be rounded upwards).

14. Honesty Policy – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others. Students found in violation of this policy will receive a failing (E) grade in the course.

15. Accommodation for Students with Disabilities – Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

16. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
    a. University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
    b. SHCC mental Health, Student Health Care Center, 392-1171,
    c. Personal and Counseling Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
    d. Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

17. Software Use – All faculty, staff and student 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.

EMA 4324 - Stability of Materials
Fall 2014 - Dr. R. K. Singh

Week	Lecture	Day	Date	Topic	HW Due	Reading
	1	M	25-Aug	Introduction, Motivation, and Objectives		
1	2	W	27-Aug	Overview of corrosion of different material classes		
	3	F	29-Aug	Overview of corrosion "forms" and ASTM testing		
		M	1-Sep	Holiday -Labor Day		
2	4	W	3-Sep	Corrosion Chemistry Video -1		
	5	F	5-Sep	Case Study -1 Pipeline Corrosion		
	6	M	8-Sep	***Acclerated testing/ SHE and EMF Series***		
3	6	W	10-Sep	Review; Some applications of the Nernst equation		
	7	F	12-Sep	Nernst to Pourbaix diagrams		
	8	M	15-Sep	Pourbaix diagrams (continued)		
4	9	W	17-Sep	Pourbaix diagram - water		
	10	F	19-Sep	Case Study Lecture 2		Jones, 52-58
	11	M	22-Sep	Pourbaix diagram - silicon & carbon		Jones, 58-64
5	12	W	24-Sep	Review session		
	13	F	26-Sep	**Exam 1 - Mechanisms and electrochemical thermodynamics**		
	14	M	29-Sep	Kinetics: Faraday's laws & corrosion rates		Jones, 75-80
6	15	W	1-Oct	Activation and Concentration Polarization		Jones, 80-86
	16	F	3-Oct	Mixed Potential Theory - I		Jones, 86-101
	17	M	6-Oct	Mixed Potential Theory - II		
7	18	W	8-Oct	Passivity - principles and applications		Jones, 116-122
	19	F	10-Oct	Pilling-Bedworth ratio		Jones, 418-420
	20	M	13-Oct	Electrochemical impedance spectroscopy		Jones, 109-113
8	21	W	15-Oct	Galvanic corrosion		Jones, 168-177
		F	17-Oct	***University Holiday - No Classes - Homecoming***		
	22	M	20-Oct	Galvanic corrosion		Jones, 199-234
9	23	W	22-Oct	Localized corrosion - pitting and crevice corrosion		
	24	F	24-Oct	Localized corrosion - pitting and crevice corrosion		
	25	M	27-Oct	Case II - Chemical Mechanical Polishing		
10	26	W	29-Oct	**Exam 2 - Mechanisms and Electrochemical kinetics**		
	27	F	31-Oct	Protection: Cathodic & anodic protection - I		Jones, 439-450
	28	M	3-Nov	Protection: Cathodic & anodic protection - II		
11	29	W	5-Nov	Environmentally-assisted cracking		Jones, 235-249
	30	F	7-Nov	Protection: coatings, electroplating, inhibitors		Jones, 477-480, 502-509
	31	M	10-Nov	Case I - Characterization Methods		
12		W	12-Nov	***Case Ii - Characterization Methods***		
	32	F	14-Nov	TBA		
	33	M	17-Nov	Contemporary Issues		handout
13	34	W	19-Nov	Contemporary Issues		handout
	35	F	21-Nov	Contemporary Issues		handout
	36	M	24-Nov	Contemporary Issues		handout
14	37	W	26-Nov	Contemporary Issues		handout
		F	28-Nov	***University Holiday - No Classes - Thanksgiving***		
	38	M	1-Dec	Contemporary Issues		handout
15	39	W	3-Dec	Contemporary Issues		handout
	40	F	5-Dec	Contemporary Issues		handout
16	41	M	8-Dec	Contemporary Issues		handout
	42	W	10-Dec	Exam 3 - Comprehensive		
17	-					