COURSE SYLLABUS WINTER 2015

AA 250: Nanomaterials for Aerospace

Room & Schedule: Cummings Art, Rm. 4, Mon. & Wed. 2:15-3:45 p.m.
Course Website: http://xlab.stanford.edu/aa250

Instructor: Prof. Debbie G. Senesky
dseseky@stanford.edu
Office Hours: Fri. 2:00-3:00 p.m. in 254 Durand Building

COURSE DESCRIPTION

Properties of nanomaterials and current approaches for engineering spacecraft, aircraft, and subsystems with nanotechnology. Manufacturing of nanomaterials; nano-fiber reinforced composites; structural mechanics of nanomaterials; structure-property relationships; and application of nanotechnology for lightweight structures, thermal protection, nanopropellants, and nanoelectronics. AA 240A is a highly recommended (but not mandatory) prerequisite.

By the end of the course students will be able to:

1. Analyze the behavior of nanomaterials used in aerospace applications (e.g., nano-fiber reinforced composites)
2. Identify state-of-the-art approaches for using nanomaterials in aerospace applications
3. Exercise oral and written communication skills by presenting to peers and obtaining feedback

TENTATIVE LECTURE SCHEDULE

Week 1 (Mon., Jan. 05 & Wed., Jan. 07)
Lecture 1: Introduction to course structure; Why nano?
Lecture 2: Types of nanomaterials; Aerospace applications for nanotechnology
**Homework 1 Due

Week 2 (Mon., Jan. 11 & Wed., Jan. 14)
Lecture 3: Structure-property relationships
Lecture 4: Manufacturing and synthesis of nanomaterials
**Homework 2 Due
**Select topic for midterm presentation

Week 3 (Mon., Jan. 19 & Wed., Jan. 21)
Lecture 5: MLK Day (holiday, no class)
Lecture 6: Nano-fiber reinforced composites

Week 4 (Mon., Jan. 26 & Wed., Jan. 28)
Lecture 7: Nano-fiber reinforced composites, continued
Lecture 8: Structural mechanics of nanomaterials
**Homework 3 Due

Week 5 (Mon., Feb. 02 & Wed., Feb. 04)
Lecture 9: In class presentations
Lecture 10: In class presentations
**Midterm presentations in class
**Week 6 (Mon., Feb. 09 & Wed., Feb. 11)**
Lecture 11: Nanoelectronics and sensors
Lecture 12: Nanoelectronics and sensors, continued
**Homework 4 Due**
**Select topic for final presentation**

**Week 7 (Mon., Feb. 16 & Wed., Feb. 18)**
Lecture 13: President's Day (holiday, no class)
Lecture 14: Nano-scale coatings and adhesives

**Week 8 (Mon., Feb. 23 & Wed., Feb. 25)**
Lecture 15: Thermal protective systems
Lecture 16: Nanopropellants
**Homework 5 Due**

**Week 9 (Mon., Mar. 02 & Wed., Mar. 04)**
Lecture 17: Guest lecture, TBD
Lecture 18: Power/Energy generation and storage

**Week 10 (Mon., Mar. 09 & Wed., Mar. 11)**
Lecture 19: In class presentations
Lecture 20: In class presentations; Review of course materials
**Final presentations in class**

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**COURSE ASSIGNMENTS & ACTIVITIES**

**Homework (30%)**
A series of homework sets will be assigned throughout the quarter. These homework assignments will allow students to demonstrate their mastery of the concepts and principles presented in class.

**Midterm presentation (30%)**
Students will give a short oral presentation on a topic during the lecture period. In this assignment/activity, students will select a topic and find a recent (circa 2005 to 2015) journal paper on the topic. Students will review the topic and the selected journal article with the instructor (Prof. Senesky) at least 2 weeks before the scheduled presentation. The oral presentations will introduce a topic, describe the principle of operation and propose future directions for the specific topic. Students watching the presentations will be asked to provide constructive feedback to the presenters through written evaluation.

**Final project (40%)**
Students will give an oral presentation (20%) and submit a report (20%) on a topic. In this assignment/activity, students will select a topic and find recent (circa 2005 to 2015) journal papers on the topic. Students will review the topic and the selected journal articles (3 to 5) with the instructor (Prof. Senesky) at least 2 weeks before the scheduled presentation. The oral presentation and final report will introduce the topic, describe the principle of operation and propose future directions for the specific topic.
MAIN TEXTBOOK


In addition to the main textbook, the instructor will provide supplemental reading material on the AA 250 CourseWork website (https://coursework.stanford.edu/portal/site/W15-AA-250-01).

OPTIONAL TEXTBOOKS
(Reference Only, No Purchase Required)


ON CAMPUS RESOURCES

Oral Communication Program at the Center for Teaching and Learning (CTL): Oral communication coaching is available to all Stanford students. Highly-trained peer Oral Communication Tutors (OCTs) are available to provide coaching on all stages of the presentation process. OCTs can also advise on designing effective visual aids, reducing speech anxiety, and practicing for job interviews.

CTL Website: http://ctl.stanford.edu/speaking/oralcomm.html

Engineering Library (Terman): The Frederick Emmons Terman Engineering Library (in Huang Engineering Center) supports the research and teaching of the School of Engineering and Physics and Applied Physics Departments, as well as the research labs and institutes of the following departments: Aeronautics & Astronautics, Bioengineering, Civil & Environmental Engineering, Computer Science, Electrical Engineering, Management Science & Engineering, Materials Science & Engineering, and Mechanical Engineering. Library space and services are designed to foster collaboration among students and faculty. Subject librarians are assigned as liaisons to each department to facilitate discovery, retrieval, and integration of print and digital information.

Terman Library Website: http://library.stanford.edu/libraries/englib/about
Guide on searching for articles: http://library.stanford.edu/guides/find-articles