San José State University
Department of Chemical and Materials Engineering
Materials Engineering 297
Special Topics: Applications of Nano Materials
Fall 2009

Instructor:	Dr. Jill Johnsen
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Office Hours:	Thursdays 5:30-6:30 pm
Class Days/Time:	Thursdays 6:30-9:20 pm
Classroom:	Engineering 303

Prerequisites:

MatE 297 is elective class for graduate students for MatE. Other Engineering or Science majors, such as ChemE, EE. ME with proper prerequisites are welcome to enroll. Prerequisites (or equivalent at community college) are:

Chem 11A (or Chem 1A) General Chemistry

Math 133A Ordinary Differentiate Equation

Physics 51/71 (Elec. & Magn.) General Physics

MatE: 25: Introduction to Materials

EE98 Introduction to Circuit Analysis

MatE 153: Electric, Optical, Magnetic Properties of Materials

It will be helpful if you have already taken MatE 205 (Mechanical Behavior), 241 (Characterization) and 251 (Thermodynamics) but not required. We will go over some fundamentals again in the class

Faculty Web Page

Course syllabus, PowerPoint slides from lecture, in-class discussion questions and weekly writing assignments will be posted on http://www.exo.net/~jillj/MatE297.htm

Course Description

This graduate level course will give an advanced survey to different aspects of active research in nanotechnology, covering the broad area of thermodynamics, physics, chemistry, and material science. We will go over some fundamental properties of nano materials due to its reduced size and dimension, such as thermodynamic, mechanical, electronic, magnetic, optical and bio-chemical properties as well as its synthesis, process, characterization and nano fabrication / imprint methods. Then we will focus on the applications associated with those unique properties. Topics will cover a board range from nano-grained structural materials, to nano particles / composites in clean renewable energy, from nano logic / memory device to nano-bio materials in drug delivery, from nano optical device to Aerospace applications.

Guest lecturers from both industry and academia will be invited to address contemporary issues that span a broader range in the area of nanotechnologies

Required Texts/Readings

There is no required textbook for this course

Suugested Readings

Rotello, Vincent. **Nano Particles, Building Blocks for Nanotechnology**. Springer (2004)

Waser, Rainer. **Nanoelectronics and Information Technology**. Wiley-VCH (2003)

Ratner, Mark and Daniel Ratner. **Nanotechnology - A Gentle Introduction to the Next Big Idea**. 1st edition, Prentice Hall PTR (2002).

Drexler, K. Eric. **Engines of Creation: The Coming Era of Nanotechnology**. Doubleday; New York, NY (1987).

Ball, Phillip. **Designing the Molecular World: Chemistry at the Frontier**.. Princeton University Press, Princeton, NJ (1994).

Scientific American, eds. **Understanding Nanotechnology**. New York, NY: Scientific Ameican (2002).

Crandall, B. C. and Lewis, James (Eds.). **Nanotechnology: Research and Perspectives**. MIT Press; Boston, MA (1992).

Drexler, K. Eric. **Nanosystems: Molecular Machinery, Manufacturing, and Computation**. 1st edition Wiley Interscience, (1992).

Drexler, K. Eric and Peterson, Chris. **Unbounding the Future: The Nanotechnology Revolution**. William and Morrow Company Inc.; New York, NY (1991).

Assignments and Grading Policy

Discussion Questions	25 %
Weekly Writing Assignments	25 %
Final Presentation	25 %
Final Poster	25 %

Discussion Questions:

There will be in-class discussion questions throughout the semester to ensure your progress and participation in the class. Discussion questions are designed as a problem solving exercise. It is a flexible style which allows group discussion during and even after the class. It can be turned back either during the class or at the beginning of the next class. The answers will be posted on the course website.

Weekly Writing Assignments:

Each week you will be asked to complete a short writing assignment. You will be asked to answer one or two questions related to the topics discussed during class in paragraph form. Please type up your responses and bring them to lecture the following week or submit them via email by the due date.

Final Presentation:

You will be asked to prepare a final oral presentation on a selected nanoscale structure, effect, device, or process of your choice. Prepare the presentation as if you were presenting at a nanotechnology conference. The presentation should be 15 minutes in length and should include a visual component such as power point slides or overhead transparencies. The room will be equipped with a computer and projector. You may bring your own laptop, or bring in your presentation on a USB flash drive or a CD.

Final Poster:

You will be asked to electronically prepare a final poster on your selected nanoscale structure, effect, device, or process. You will create a poster as if you were attending a poster session at a nanotechnology conference. The poster should be approximately 3-foot by 4-foot and can be created using power point. The poster will be submitted electronically and will not be printed.

Library Liaison Chemical & Materials Engineering: Robert Bruce (408) 808-2046 Robert.Bruce@sjsu.edu

Classroom Protocol

Please respect your fellow students and instructor by arriving to class on time and silencing your cell phone.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's Catalog Policies section at http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic calendar web page located at http://www.sjsu.edu/academic_programs/calendars/academic_calendar/. The Late Drop Policy is available at http://www.sjsu.edu/aars/policies/latedrops/policy/**.** Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at http://www.sjsu.edu/advising/.

Academic integrity

Students should know that the University's Academic Integrity Policy is available at http://sa.sjsu.edu/judicial_affairs/faculty_and_staff/academic_integrity/index.html. Your own commitment to learning, as evidenced by your enrollment at San Jose State University and the University's integrity policy, require you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sa.sjsu.edu/judicial_affairs/index.html.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include in your assignment any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Policy F06-1 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with the Disability Resource Center (DRC) at http://www.drc.sjsu.edu/ to establish a record of their disability.

Student Technology Resources

Computer labs for student use are available in the Academic Success Center located on the 1st floor of Clark Hall and on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library.
A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include digital and VHS camcorders, VHS and Beta video players, 16 mm, slide, overhead, DVD, CD, and audiotape players, sound systems, wireless microphones, projection screens and monitors.

Learning Assistance Resource Center

The Learning Assistance Resource Center (LARC) is located in Room 600 in the Student Services Center. It is designed to assist students in the development of their full academic potential and to motivate them to become self-directed learners. The center provides support services, such as skills assessment, individual or group tutorials, subject advising, learning assistance, summer academic preparation and basic skills development. The LARC website is located at http:/www.sjsu.edu/larc/.

SJSU Writing Center

The SJSU Writing Center is located in Room 126 in Clark Hall. It is staffed by professional instructors and upper-division or graduate-level writing specialists from each of the seven SJSU colleges. Our writing specialists have met a rigorous GPA requirement, and they are well trained to assist all students at all levels within all disciplines to become better writers. The Writing Center website is located at http://www.sjsu.edu/writingcenter/about/staff/.

Peer Mentor Center

The Peer Mentor Center is located on the 1st floor of Clark Hall in the Academic Success Center. The Peer Mentor Center is staffed with Peer Mentors who excel in helping students manage university life, tackling problems that range from academic challenges to interpersonal struggles. On the road to graduation, Peer Mentors are navigators, offering "roadside assistance" to peers who feel a bit lost or simply need help mapping out the locations of campus resources. Peer Mentor services are free and available on a drop –in basis, no reservation required. The Peer Mentor Center website is located at http://www.sjsu.edu/muse/peermentor/

Materials Engineering 297: Applications of Nano Materials

Table 1 Course Schedule - subject to change with fair notice

Week	Date	Topics
1	08-27-09	Introduction to Nanomaterials
2	09-03-09	Guest Lecture: Dr. Rich Barber Santa Clara University
3	09-10-09	Carbon Nanostructures and their Applications
4	09-17-09	Guest Lecture: Dr. Scott Sandford NASA Ames
5	09-24-09	Materials Characterization and Imaging Techniques
6	10-01-09	Guest Lecture: Dr. Tobias Beetz Stanford CPN
7	10-08-09	Quantum Dots and Nanobiotechnology
8	10-15-09	Guest Lecture: Dr. Mike Isaacson BIN-RDI UCSC and NASA Ames
9	10-22-09	MEMS/NEMS, Energy Applications and Cleantech
10	10-29-09	Molecular Foundry Tour 2pm LBNL - no evening lecture
11	11-05-09	Student Presentations
12	11-12-09	Student Presentations
13	11-19-09	Student Presentations
14	11-26-09	**Thanksgiving**
15	12-03-09	Nano Film Fest – Nano in Science Fiction
16	12-10-09	7:45-10:00 pm Final Posters Due Electronically Nano Film Fest continued