

Nano Structured Materials Course Syllabus*

Course Goals:

This course is aimed at preparing students for further industrial or academic work in the field of nano-manufacturing and applications.

Course Objectives:

The course content has been structured to help the student achieve the following objectives:

- 1. To gain an understanding of the **principles** of nanotechnology; **characterization** of nano-structured materials; and **tools and equipment** for producing and assembling at the nano scale.
- 2. To acquire practical experience by having laboratory sessions.
- 3. To cultivate interest in the research and development of nanotechnology for future advancement of your career.

Required Text:

Guozhong Cao (2004). Nanostructures and Nanomaterials: Synthesis, Properties & Applications, 448 pages, Imperial College Press, ISBN-10: 1860944159

Journal Articles:

To be provided along the course

Course Program:

Week	Topic	Chapter	Grading
Feb 10	Introduction to the course, Students Interests and Expectations ; Historical perspective of micro and nano manufacturing technology, Advantages and applications of nanotechnology Assign HMW1	1	
Feb 17	Materials overview, atomic structure, bonding, polymers, electrical characteristics, periodic table, crystal structures and defects, physical chemistry of solid surfaces, Introduction to Si-based materials, Ge-based materials Student presentations (Each student records a 5 minute presentation about a specific tool) Quizz 1; Assign HMW2; Deliver HMW1	9	
Feb 24	Characterization Tools: Optical microscopy, Profilometry, Ellipsometry, Spectrophotometer, Scanning Electron Microscope, AFM, FFM Quizz 2; Assign HMW3; Deliver HMW2	2	
Mar 2	Overview of Nano Fabrication Methods: Top-down and bottom-up approaches, lithography, deposition, CVD, PVD, etching, and material modification methods, processes and equipment Quizz 3; Assign HMW4; Deliver HMW3	7	
	Laboratory Session 1. Aerogel (L)		
Mar 9	Zero dimensional Nano structures (Nano Particles) - Fabrication procedures, sol-gel processing, applications, properties and applications of Nano Particles Quizz 4; Assign HMW5; Deliver HMW4	3	

Mar 16	One dimensional Nano structures - Nano wires and nanorods, fabrication methods, Properties and applications of Nano Wires. Quizz 4; Assign HMW6; Deliver HMW5 Propose a Term Paper in no more than 200 words	4	
	Laboratory Session 2. Metal Oxide Nanoparticles (L)		
Mar 23	Two dimensional nano structures Quizz 5; Assign HMW7; Deliver HMW6	5	
Mar 30	Top down fabrication procedures, Lithography, Pattern transfer methods, Wet Etching and Dry etching. Quizz 6; Assign HMW8; Deliver HMW7	7	
	Laboratory Session 3. Gold Nanoparticles (L)		
Abr 13	Application of nano materials, Carbon Nano Tubes, Quantum dots, etc., Organic compounds and bio-applications of nano materials. Part 1 Quizz 7; Assign HMW8; Deliver HMW7	6,9	
Apr 20	Application of nano materials, Carbon Nano Tubes, Quantum dots, etc., Organic compounds and bio-applications of nano materials. Part 2 Quizz 8; Deliver HMW8		
	Laboratory Session 4. Solar Cell. (L)		
Apr 27	Deliver Term Paper and present it before the group. Presentation time 5 minutes; Q&A 5 minutes.		
May 4	Paper discussion		
May 11	Paper discussion		
May 18	Paper discussion		
May 25	Paper discussion		
Jun 3	Final Examination		
	Midterm Examination		25%
	Term Paper		20%

	Homeworks **		20%
	Lab. Session Participation		10%
	Final Examination		25%

* Syllabus based on a course lectured by Dr. Nageswara Rao Posinasetti, at University of Northern Iowa Cedar Falls, IA 50614—0178, on Fall 2010.

** Some of the Homeworks are laboratory sessions and the delivery is a Laboratory Report.

The ones with (L) are compulsory.

Internet Sources

ASME Nanotechnology Institute	http://www.nanotechnologyinstitute.org
EUSPEN (European Union Precision Engineering and Nanotechnology)	http://www.euspen.eu/
Foresight Institute	http://www.foresight.org/
Information on Nanotechnology	http://www.nanomagazine.com/
Institute of Nanotechnology	http://www.nano.org.uk/
National Nanotechnology Initiative	http://www.nano.gov/
Information on Nanotechnology	http://www.nanomagazine.com/
Google Nanotechnology directory	http://www.google.com/Top/Science/Technology/Nanotechnology/
Information on Nanotechnology	http://www.nanowerk.com/
Nanocolors _ the nanotech 2.0 hub	http://nanocolors.wordpress.com/
Swiss Nanoscience Institute	http://www.nanoscience.ch/nccr/
Nanotechnology Education	http://www.nano4me.org/ http://nanoengineer-1.com/content/index.php?option=com_frontpage &Itemid=1 http://nanozone.org/
Center of Integrated Nano mechanical Systems	http://mint.physics.berkeley.edu/coins/
Video on Nanotechnology	http://www.vega.org.uk/video/programme/3
IBM Research labs in Zurich	http://www.zurich.ibm.com/st/nanoscale/
European Nanotechnology gateway	http://nanoforum.org/
Toward Advanced Nanotechnology	http://e-drexler.com/index.html

AAAS	http://www.eurekalert.org/context.php?context=nano&show=backgr ound
Medical applications of nano	http://nano.cancer.gov/
Small Times magazine	http://www.electroiq.com/index.html
Carbon Nano Tubes	http://www.pa.msu.edu/cmp/csc/nanotube.html
International Council on Nanotechnology	http://icon.rice.edu/
Nanoparticle Information Library	http://nanoparticlelibrary.net/index.asp
Univ. of Sussex and Bristol, UK	http://www.nanofolio.org/win/
Nano Dictionary	http://pages.unibas.ch/colbas/ntp/NanoDictionary.pdf

ASSIGNMENTS

1. There shall be eight (8) assignments/topics
2. The report (between 3 to 5 pages in APA format) for each of the assignment must be produced from a computer word processing program.
3. You must use this format:
 - Margins: 1" all around
 - Font: Arial (12pt)
 - Print in "normal" or "high quality" mode (do not use draft or quick print mode).
 - Set up your report as an internal memo:
4. Use single space in header and double space in body of document
5. Staple in upper left corner.
6. Writing style can be in 1st or 2nd person.
7. The narrative should be clear and concise.
8. Spell check and grammar check for accuracy.

DATE: Month Day, 2020

To: Dr. Jaime Bonilla

FROM: Student

RE: Homework Topic

Term Paper:

It is expected to be a detailed study and presentation of a topic relevant to the course content and related to your interest. The topic must be discussed with the instructor by **March 16**. The topic and a written brief, describing the topic should be submitted by **April 27**. The term paper, about 8-10 pages in APA format, should be submitted on the day of the presentation (You might be making your presentation on any session, starting on April

27. Questions in final examination may include some of the materials presented by your classmates.

Laboratory Demonstration:

Students will be exposed to practical operations, and experimental demonstrations of some of the equipment for Nano fabrication available in Monterrey Tech. Students will produce a technical report on the experiences.

Midterm Examination:

It is a take home examination to be hand out on the following Monday

Final Examination:

The final examinations will cover all topics covered during lectures, quizzes and presentations made by graduate students. The coverage for the examinations will be known prior to the examination.

Academic dishonesty:

Cheating of any kind on examinations and/or plagiarism of papers or projects is strictly prohibited. Anyone caught passing off the work of others as their own (i.e., copying from a book/journal or cut and pasting from internet sources without appropriate citation) runs the risk of immediately failing the course and expulsion from the class and the University. For more institutional rules regarding academic dishonesty, please see the University policies.

