

MMAT 4241- Nanomaterials

Spring, 2008 Every Tuesday, Thursday; 9:30-10:45 pm; Bronwell 124

Instructor: Prof. Bryan D. Huey
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Office Hours: 11:30-12:30 Wednesdays

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Required Textbook: Introduction to Nanoscale Science and Technology
by M. Di Ventra, S. Evoy, J. Heflin, Springer (2004).
ISBN 1-4020-7720-3

Additional Readings: Modern research papers will also be provided regularly
for in-class discussions and written review.

Goals: Materials Science is frequently the limiting factor in realizing the
benefits of nanoscale science and technology. This course will introduce students
to nanoscale materials and device fabrication, assembly, characterization, and
operation, with an emphasis on materials science principles which allow these
achievements. Along with textbook readings and assignments, we will also read
and discuss recent publications in this rapidly expanding area of research,
development, and applications.

Students will have an opportunity to gain the following specific skills and abilities
through lectures, class participation, and assignments:

- a. an ability to apply knowledge of mathematics, science, and engineering
- g. an ability to communicate effectively
- h. the broad education necessary to understand the impact of engineering
solutions in a global and societal context
- i. a recognition of the need for, and an ability to engage in life-long learning
- j. a knowledge of contemporary issues

Grading: The final course grade will depend on student performance in 6 areas:
homework (5*10% each=50%), quizzes (3*5% each=15%), summaries of research
papers (4*3% each=12%), lead of research paper discussion (1*5%=5%), general
class participation (6%), and an oral presentation (12%). Up to 5% of extra credit
may also be earned. Expectations will be proportionally higher for any graduate
students enrolled in the class.

Syllabus: MMAT 4241, Nanomaterials

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Lab Projects: None.

Date	Lecture	Topic	Reading	Remarks
1/20	1	Introduction	None	
1/22	2	Electron Microscopy	Ch 3	paper summary due
1/27	3	AFM and Nanoindentation	Ch 3	paper discussion
1/29	4	SPM and Nanolithography	Ch 3	Quiz 1
2/3	5	Optical lithography	Ch 1	HW 1 due
2/5	6	Advanced Lithography	Ch 1	paper discussion
2/10	7	Modern Transistors	Ch 9,10,11,12	paper discussion
2/12	8	Next Generation Transistors	Ch 9,10,11,12	paper summary due
2/17	9	Review-Particle in a Box / electronic and optical properties	Any intro quantum text (pchem or physics)	HW 2 due
2/19	10	Single Electron Transistors	Ch 9,10,11,12	paper discussion
2/24	11	Self Assembly I	Ch 2	paper discussion
2/26	12	Self Assembly II	Ch 2	Quiz 2
3/3	13	MEMS/NEMS I	Ch 15,16,17	paper discussion
3/5	14	MEMS/NEMS II	Ch 15,16,17	HW 3 due
3/10		No Class: Spring Break		
3/12		No Class: Spring Break		
3/17		No Class		
3/19		No Class		
3/24	15	Quantum Dots	Ch 19,20	paper summary due
3/26	16	Magnetic Storage Devices	Ch 13,14	paper discussion
3/28		Emergency Snow Day		
3/31	17	Next generation data storage		paper discussion
4/2	18	Nano and Energy	???	HW 4 due
4/7	19	Nano and Carbon and other	Ch 4,5,6	paper discussion
4/9	20	Nano-bio-mimetics	Ch 21,22,23	Quiz 3
4/14	21	Nano and cells / creatures		paper discussion
4/16	22	Nano-bio-fluidics / drug delivery	Ch 21,22,23	HW 5 due
4/21		Presentations	3 speakers	
4/23		Presentations	4 speakers	
4/28		Presentations	4 speakers	
4/30		Presentations	4 speakers	
5/4		Presentations, 8-10am	7 speakers	