Syllabus
Nanonstructures: An Introduction [Physics 301]
Spring 2009

Meeting time:
Tu/Th: 9:30am – 10:45am

Room:
Physics 202

Textbook:
“Introduction to Nanoscale Science and Technology”
Occasionally, additional reading materials may be distributed

Instructor:
Dr. A. Yamilov, Email: yamilov@mst.edu Tel: x6793 Office: Physics 117
Office hours: By appointment

Topics to be covered in the course:*

I: Nanoscale Fabrication and Characterization.
   1. Nanolithography
   2. Self-Assembly and Self-Organization
   3. Scanning Probe Microscopes

II: Nanomaterials and Nanostructures.
   4. The Geometry of Nanoscale Carbon
   5. Fullerenes
   6. Carbon Nanotubes
   7. Quantum Dots
   8. Nanocomposites

III: Nanoscale and Molecular Electronics
   9. Advances In Microelectronics
  10. Molecular Electronics
  11. Single Electron Transistors

IV: Nanotechnology in Magnetic Systems
  12. Nanostructures For Quantum Computation
  13. Magnetoresistive Materials And Devices
  14. Nanotechnology In Magnetic Storage

VI: Nanoscale Optoelectronics.
  18. Quantum-Confined Optoelectronic Systems
  19. Organic Optoelectronic Nanostructures
  20. Photonic Crystals

*Topics may be added/omitted depending on our progress

Goals of the course:
- To overview field of nanotechnology with an emphasis on physical phenomena involved
- Lay a foundation for a research career in the rapidly growing area of nanotechnology
- Enhance students competitiveness on job market
Course policies

Final grade makeup:

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<tr>
<th>Component</th>
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<tr>
<td>Homework</td>
<td>35%</td>
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<td>Presentation</td>
<td>15%</td>
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<tr>
<td>Midterm exam</td>
<td>25%</td>
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<tr>
<td>Final exam</td>
<td>25% (Not cumulative)</td>
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Homework:
- During each Thursday class (excluding the weeks before the midterm and the final exams) you will be assigned a problem from the end of the chapter discussed during current week.
- In few chapters where problems are not provided I will make up a problem.
- Neatly handwritten or typed solutions are due on the Tuesday's lecture of the following week.
- Homework will be accepted only until the end of the class on the following Thursday (with 20% penalty for turning the assignment after the deadline).
- There will be 13 homework assignments during semester.
- At the end of the course two lowest homework grades will be dropped.

Presentation:
- Every student will be asked to prepare one 15 minute PowerPoint presentation at the end of a Thursday class (excluding the first, the last and the week before the midterm).
- You will be notified one week before your presentation is due.
- You are free to suggest a topic related to your area of interest/research. Your presentation topic should be related to the material discussed in this course and it has to be approved by me before you start to prepare it.
- If you cannot pick a topic on your own, I will help you by suggesting a few.
- Possible topics can include a particular fabrication technique; measurement procedure; a miniature device; a physical phenomenon enabling certain functionality, etc.
- Your presentation should contain the following parts:
  (i) Brief history of the subject of your presentation;
  (ii) Detailed description of the subject;
  (iii) Describe how it enabled (or was enabled by) an advancement in nanotechnology;
  (iv) Possibly, how it is being used in our every-day life;
  (v) Bibliography used in preparing your presentation.
- You may use Internet as a helpful source of information.
- You are encouraged to consult with me before finalizing your presentation.
- Your grade for the presentation will be determined based on:
  (i) Quality of your PowerPoint presentation. Correctness, completeness and appearance will be considered – 50% of the grade
  (ii) Your oral presentation – 30% of the grade
  (iii) Your ability to answer questions related to the topic of your discussion – 20% of the grade
Midterm and final exams:
• Midterm exam will be given on Tuesday, March 10 during regular class.
• Final exam will be given during the finals week, exact date/time TBA.
• Final exam will only include the material covered after the midterm.
• Both the midterm and the final tests will consist of five questions (15 min/per question) of medium difficulty level.
• Test questions will be drawn from the end of the chapters covered in the corresponding portion of the course.
• In chapters where (i) problems are not provided or (ii) there are too few of them (iii) the problems are generally too difficult – I will make up a list of possible problems and distribute it when we discuss that chapter. Only material presented in the textbook will be tested.
• You will be allowed to use the textbook but not your notes during the tests.

Test makeup policy:
• In exceptional cases of documented medical or personal emergencies, a makeup test will be provided.
• A makeup test will be composed using the same guidelines as the test missed.

Final grade:
• The letter grades will be assigned according to the following rules:
  A – 89.5% of total possible points
  B – 79.5% of total possible points
  C – 69.5% of total possible points
  D – 59.5% of total possible points
  F – below 59.5% of total possible points

Disability:
• If you have a documented disability, please, provide me with the letter from Disability Support Services in the beginning of the semester.
• I will be happy to work with DSS to accommodate you in this course.
• More resources for students with disabilities are available at http://dss.mst.edu
## Schedule

### January

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Homework #1 due on Tu in class
Homework #2 due on Tu in class

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Homework #4 due on Tu in class
Homework #5 due on Tu in class
Homework #6 due on Tu in class

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Homework #7 due on Tu in class
Midterm exam

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Homework #8 due on Tu in class
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Homework #10 due on Tu in class
Homework #11 due on Tu in class
Homework #12 due on Tu in class

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Homework #13 due on Tu in class
Final exam (TBA)