



WISCONSIN POLYTECHNIC UNIVERSITY

NANO-101

Explorations in Nanotechnology

Friday Lab, 10:10 AM - 1:10 PM, JSA 354

Tuesday Thursday Lectures, 12:20 PM, JSW 113



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JSW 234D

Office Hours: TuTh 9:05 AM and Tu-F 1:25 PM

Welcome! The schedule may change slightly as we go through the fun stuff together.

Course Description: Discussion of the main concepts in nanoscience with an exploration of societal and environmental impacts. This basic lab course will introduce students to the science and ethics of nanotechnology. Ethical and policy questions surrounding new or anticipated future technologies, including nanotechnology, artificial intelligence, genetic engineering, cyborg technologies, surveillance, and robotics will be addressed.

Gen Ed Attributes:

ARNS (Analytical Reasoning and) **Natural Science** with Lab

CISS Cross Disciplinary **Issues:** primary discipline = physics; secondary discipline = sociology

SRER Social Responsibility and **Ethical Reasoning**

Credit Hours: 3

Prerequisite(s): None.

Course Resources: Your readings will come from these three books. The first one is all about the sociological and environmental issues. The other two are more about the science. The last one is a great collection of artist renderings. Taken together, they form our textbook.

What is Nanotechnology and Why Does It Matter? From Science to Ethics; Authors: Fritz Allhoff, Patrick Lin and Daniel Moore; **ISBN:** 978-1-4051-7544-9

Nanotechnology: A Gentle Introduction to the Next Big Idea; Authors: Mark Ratner and Daniel Rater; **ISBN:** 101400-5 2007

Nanoscale: Visualizing an Invisible World; Authors: Kenneth S. Deffeyes and Stephen E. Deffeyes; **ISBN:** 978-0-262-01283-6

Course Objectives:

At the completion of this course, students will be able to:

1. Explain that material properties on the nanometer scale are different than those at other scales.
2. Evaluate, observe and quantify physical phenomena on the nanometer scale.
3. Synthesize materials at the nanoscale.
4. Recognize issues of social responsibility and/or ethics related to nanotechnologies.
5. Apply social responsibility and/or ethical concepts in decision-making in order to make sound individual and societal choices in relation to nanotechnologies.
6. Understand and respectfully reason about issues in nanotechnology concerning social responsibility and/or ethics such as human enhancement, genetics, and distributive justice.
7. Analyze case studies about nanotechnology from a sociological perspective.
8. Discuss nanotechnological issues of significant and current concern and their relationships with areas of society such as medicine, the military, energy and sustainability.

Graded Assignment Categories: We'll do labs, worksheets, and group activities mostly in class, though you may need to take them home to finish them before turning them in. These in-class activities are important for helping you to process new information and ideas.

There will also be one midterm and one final exam. The exams are a way for you to organize all of your new knowledge and help you retain it better. 😊

| | |
|--------------|-----|
| Labs | 20% |
| Assignments | 20% |
| Midterm Exam | 30% |
| Final Exam | 30% |

The *Labs* grade will come from turning in weekly, individual lab reports. At the end of the semester, you'll have plenty of practice writing them and can choose your favorite to write up formally. The single formal lab report will be $\frac{3}{4}$ of the lab grade, with the other $\frac{1}{4}$ coming from weekly reports.

The *Assignments* category will include reading worksheets and *activities* done in class. Reading worksheets will help you figure out what I think is important from your reading assignment. When we work on those in class, it will help you improve your technical reading and communication skills. The *activities* will be educational, hands-on learning designed to give more input to your senses so that you can develop more intuition about the concepts important to this topic.

The *Midterm Exams* will be partly multiple choice and partly essay. You'll get lots of practice with the exam questions from doing the assignments. The questions on the exam come from your assignments. You'll have three essay questions to choose from, but you'll only need to write one. The essay will be two to three paragraphs long with a structure that you'll practice in class.

The *Final Exam* will be a two minute presentation on a course topic of your choice. You'll have plenty of opportunities to practice this presentation before the final exam. I like to do presentations for the final because they are lower stress for many students, but also because it gives you a way to look over all of the course material and choose the parts that you enjoy best. It is a fun, summative

assessment of your knowledge and abilities in nanotechnology.

Letter Grade Distribution: To figure out your final grade, you can check D2L or compute it directly. Average assignment scores in each grade category, then multiply by the fraction of the total grade. Add them all up to get a final number. For example, if you got 90% on all your labs, 80% on all your assignments, 85% on the midterm and 95% on the final, your grade would be

$$90 * 0.20 + 80 * 0.20 + 85 * 0.30 + 95 * 0.30 = 88$$

An 88% would earn you a letter grade of B+.

| | | | |
|---------------|----|---------------|----|
| ≥ 93.00 | A | 73.00 - 76.99 | C |
| 90.00 - 92.99 | A- | 70.00 - 72.99 | C- |
| 87.00 - 89.99 | B+ | 67.00 - 69.99 | D+ |
| 83.00 - 86.99 | B | 63.00 - 66.99 | D |
| 80.00 - 82.99 | B- | 60.00 - 62.99 | D- |
| 77.00 - 79.99 | C+ | ≤ 59.99 | F |

Finally, I use an attendance multiplier on your final grade average. Here's how it works:

1. I will take attendance daily.
2. The fraction of days you are present is the fraction I will multiply to your final average.
3. Coming to class late (after I've taken attendance) counts as an absence.

To avoid negative impacts to your grade, just show up for every class! That is my goal, to get everybody to come to class on time each time. This will help establish you as a community of co-learners who can help each other with the course. It also makes it more fun!



D2L (Learn@UW-Stout) Access: This course will be delivered in part using the learning management system Learn@UW-Stout, also known as D2L. You will use your UW-Stout account to login to the course from the Learn@UW-Stout login page. In D2L, you will access online content, course materials, and your gradebook.

Evaluation of Instruction: The University of Wisconsin-Stout is committed to continuous improvement. The faculty strongly encourages students to provide complete and honest feedback for this course. Please take this activity seriously because we depend on your feedback to help us improve so you and your colleagues will benefit. Information on how to complete the evaluation will be provided towards the end of the course.



Disability Services: UW-Stout strives for an inclusive learning environment. If you anticipate or experience any barriers related to the format or requirements of this course please meet with me so that we can discuss ways to ensure full access. If you determine that additional disability-related accommodations are necessary please contact the Disability Services office (206 Bowman

Hall, 2-2995).

Academic Honesty: Students are expected to work independently when not doing assigned group work. **Offering** and **accepting** solutions from others is an act of **plagiarism**, which is a serious offense and **all involved parties will be penalized according to the Academic Honesty Policy**. Discussion amongst students is encouraged, but when in doubt, direct your questions to a professor. The full text of the Academic Honesty Policy can be found at this link - hover to see it.



Important Note: This syllabus, along with course assignments and due dates, are subject to change. It is the students responsibility to check D2L for corrections or updates to the syllabus.

Incomplete Policy: Incomplete is used only under extenuating circumstances that prevents undergraduate student from finishing course work during the regularly scheduled course period. Incompletes can be used for graduate courses only under extenuating circumstances that prevent the student from completing the last major course assignment. The university allows up to one year for course work completion. After one year the course grade “I” expires to “F”.

Tentative Course Schedule: This is subject to change, but it will give you a ball park estimate. **Labs are colored red. Activities are colored magenta. Assignments are in yellow.** The reading assignments are in code by the initial of the first author’s last name and then by book chapter. For example, if I want you to read Ch. 1 of the Allhoff book *What is Nanotechnology* the assignment would be abbreviated as *Read A1*.

Exam dates are in green and holidays are in grey. The weekly subject is in **blue for the first unit, orange for the second** and **purple for the third**. I’ve budgeted some **flex days in cyan**. These may get moved to different dates as we go.

| TUESDAY | THURSDAY | FRIDAY |
|---|---|--|
| Sep 5th Advising no classes | 7th Flex Day | 8th Welcome! Activity: Lab Safety Lab: Checkerboard Universe Read R1 for next class |
| 12th Size Matters: The Basics Activities Cards, Cut Nano Read A1 for next class | 14th Size Matters: The Basics Activity: Nanoventure Read R2, D4 for next class. | 15th Size Matters: The Basics Lab: Silver Nanoparticles Read R3 for next class. |
| 19th Tools: Measurement Activity: Char. Lab Tour Read R4 ‘Measuring’ (from pg 39) for next class. | 21st Tools: Measurement Activity: Sticky Fingers Read D27, D32, D38 for next class. | 22nd Tools: Measurement Lab a: Line of Resistance Lab b: PDMS Stamps Read A2 for next class. |

| TUESDAY | THURSDAY | FRIDAY |
|---|---|---|
| 26th Tools: Fabrication Activity: Clean Room Tour Read R4 ‘Making’ (fr pg 43) for next class. | 28th Tools: Fabrication Activity: Read D40 for next class. | 29th Tools: Fabrication Lab: Nanoimprint Litho Read A3 for next class. |
| Oct 3rd Nanomaterials Activity: TBA Read D3, D8 for next class. | 5th Nanomaterials Activity: TBA | 6th Nanomaterials Lab: Stained ‘Glass’ Read A4 for next class. |
| 10th Applied Nanotechnology Read R5 for next class. | 12th Applied Nanotechnology Activity: TBA Read D34, D35 for next class. | 13th Exam 1 Activity: Exam 1 Review Worksheet 4 Due |
| 17th Risk and Precaution Activity: NanoTex Fabric Read A5 for next class | 19th Risk and Precaution Activity: ‘Let’s Talk’ Read D9, D19 for next class | 20th Risk and Precaution Lab: Molecular Gastronomy Read A6 for next class |
| 24th Advisement Day | 26th Regulating Nanotechnology Activity: Play ‘Decide’ Read R10 for next class | 27th Regulating Nanotechnology Lab: See DNA Read D13, D14, D43 for next class. |
| 31st Regulating Nanotechnology Activity: Distributive Justice Read A7 for next class. | Nov 2nd Regulating Nanotechnology Guest Speaker Buchanan Read D20, D21 for next class. | 3rd Equity and Access Lab: Water Roll Read R11 for next class. |
| 7th Equity and Access Activity: TBA Guest Speaker Shiell Read D1, D2 for next class. | 9th Equity and Access Activity: Play ‘Decide’ | 10th Exam 2 Activity: Exam 2 Review Read A8 for next class. |
| 14th Environment Activity: Lotus Effect Read R6 for next class. | 16th Environment Activity: Superhydrophilics Read D17, D36, D37 for next class. | 17th Environment Lab: LEDs Read A9 for next class. |
| 21st Flex Day Read A10 for next class. | 23rd Thanksgiving Break | 24th Thanksgiving Break |

| TUESDAY | THURSDAY | FRIDAY |
|---|--|--|
| 28th Privacy Activity: TBA Read R9 for next class. | 30th Privacy Guest Speaker Shiell Read D42, D44 for next class. | Dec 1st Privacy Lab: MR Fluids Read A11 for next class. |
| 5th Medicine Activity: Latch and Catch Read R8 for next class. | 7th Medicine Read D15, D16 for next class. | 8th Medicine Lab: Magnets Read A12 for next class. |
| 12th Human Enhancement Activity: Bioengineering Read A13 for next class. | 14th Human Enhancement Guest Speaker Buchanan Read R7, D11, D12 for next class. | 15th Exam 3 Activity: Exam 3 Review |
| 19th | 21st ← Final Exam ← W(12/20) 10 AM in 113 | 22nd |

Let's have fun exploring nanotechnology together!