# Intro to Nanotechnology (PS)

## ENGR - 1050 001

## Course Description

Nanoscience sits at the intersection of the basic scientific disciplines. This technology has far reaching implications in healthcare, environment, business, and society, and has wide ranging ethical impacts in the world today. This course introduces the basic concepts of nanoscience and explores how it is changing our world.

Semester: All

## Class Meeting Time

Tuesday and Thursday

2:30 PM - 3:50 PM

Science and Industry (SI) 54

## Course Student Learning Outcomes

- Utilize fundamental physical science principles to explain the unusual chemical, optical, mechanical, and electrical properties observed with nanoscale materials.
- Investigate current applications of nanotechnology in engineering, chemistry, physics, and biology.
- Describe the tools and process used to create nanomaterials.
- Identify tools and processes used in nanoscale fabrication during a visit to the University of Utah's Nanofab facility.

- Differentiate between realistic outcomes achievable with nanotechnology and the speculative outcomes described in science fiction.
- Evaluate the promises and dangers of nanotechnology.
- Demonstrate proficiency in the use of the Markosian Library online database to obtain published scientific information for inclusion in research papers and class presentations.
- Execute six hands-on laboratory investigations and compare results to the nanoscale topics discussed in lecture.

## Engagement Plan

I will respond to email within 24-48 hours. The best way to contact me is via the Canvas Inbox, as I will prioritize this email over other modes of communication.

## Keys for Success (how to succeed in the course)

For students to be successful in this course, the following actions and student engagement activities are strongly recommended and encouraged:

1. Complete all weekly assignments and do your best.

2. Watch video lectures, study the lecture notes, PowerPoint slides, and the relevant handouts.

3. Dedicate at least three hours outside of class for assignments for every one hour spent in class.

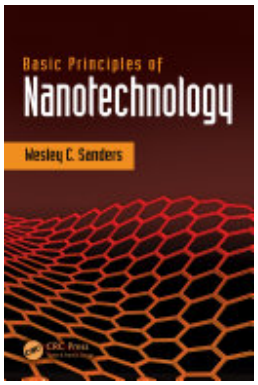
4. Use the STEM Learning Resource Center for free tutoring. See their hours here: https://www.slcc.edu/stem/tutoring/stem-learning-resources-hours.aspx

5. Do not hesitate to ask questions.

6. Turn on your Canvas Notifications so that when announcements are posted about the course you get notified immediately.

7. Be familiar with the late policy for this course.

## Required Text or Materials




**Title: Basic Principles of Nanotechnology**
**ISBN:** 9781351054409
**Authors:** Wesley C. Sanders
**Publisher:** CRC Press
**Publication Date:** 2018-07-11

For more information on textbook accessibility, contact Accessibility & Disability Services at ads@slcc.edu.

## General Education Information

PS

This course fulfills the above requirement for the General Education Program at Salt Lake Community College. It is designed not only to teach the information and skills required by the discipline, but also to develop vital workplace skills and to teach strategies and skills that can be used for life-long learning.

General Education courses teach basic skills as well as broaden a student's knowledge of a wide range of subjects. Education is much more than the acquisition of facts; it is being able to use information in meaningful ways in order to enrich one's life.

While the subject of each course is important and useful, we become truly educated through making connections of such varied information with the different methods of organizing human experience that are practiced by different disciplines. Therefore, this course, when combined with other General Education courses, will enable you to develop broader perspectives and deeper understandings of your community and the world, as well as challenge previously held assumptions about the world and its inhabitants.

## Assignment Schedule

| Due Date | Assignment Name | Assignment Type | Points |
|---|---|---|---|
| | Introduce Yourself | Discussion | 0 |
| | Introduce Yourself | Discussion | 0 |
| | Introduce Yourself | Discussion | 0 |
| | Introduce Yourself | Discussion | 0 |
| | Online Orientation Discussion | Discussion | 0 |
| | Week 1 Discussion Prompt | Discussion | 0 |
| 8/10/25 | Microscopy Summaries - (Exam 1-3 Extra Credit) | Assignment | 0 |
| 9/7/25 | Weekly Nano News - Chemistry Foundations in Nanotechnology | Assignment | 100 |
| 9/7/25 | Weekly Nano News - Introduction to Nanotechnology | Assignment | 100 |
| 9/14/25 | Weekly Nano News - Physics Foundations in Nanotechnology | Assignment | 100 |
| 9/21/25 | Weekly Nano News - Allotropic Carbon-Based Nanomaterials | Assignment | 100 |
| 9/28/25 | Weekly Nano News - Molecule-Based Nanotechnology | Assignment | 100 |

| Due Date | Assignment Name | Assignment Type | Points |
|---|---|---|---|
| 10/5/25 | Weekly Nano News - Inorganic Nanomaterials | Assignment | 100 |
| 10/9/25 | Exam 1 | Quiz | 100 |
| 10/10/25 | Lecture Quiz: Molecule-Based and Inorganic Nanomaterials | Quiz | 100 |
| 10/10/25 | Lecture Quiz: Allotropic Carbon-Based Nanomaterials | Quiz | 100 |
| 10/10/25 | Lecture Quiz: Chemistry and Physics Foundations in Nanotechnology | Quiz | 100 |
| 10/10/25 | Lecture Quiz: Introduction to Nanotechnology | Quiz | 100 |
| 10/10/25 | Molecules with Sunglasses Video Quiz | Quiz | 100 |
| 10/10/25 | Reading Quiz - Chapter 1: Introduction to Nanotechnology | Quiz | 100 |
| 10/10/25 | Reading Quiz - Chapter 2: Chemistry Foundations in Nanotechnology | Quiz | 100 |

| Due Date | Assignment Name | Assignment Type | Points |
|---|---|---|---|
| 10/10/25 | Reading Quiz - Chapter 3: Physics Foundations in Nanotechnology | Quiz | 100 |
| 10/10/25 | Reading Quiz - Chapter 4: Allotropic Carbon-Based Nanomaterials | Quiz | 100 |
| 10/10/25 | Reading Quiz - Chapter 5: Molecule-Based Nanotechnology | Quiz | 100 |
| 10/10/25 | Reading Quiz - Chapter 6: Inorganic Nanomaterials | Quiz | 100 |
| 10/10/25 | GE Signature Assignment 1 | Assignment | 100 |
| 10/26/25 | Weekly Nano News - Nanoscale Characterization | Assignment | 100 |
| 11/2/25 | Weekly Nano News - Nanofabrication Techniques | Assignment | 100 |
| 11/9/25 | Weekly Nano News - Nanoelectronics | Assignment | 100 |
| 11/13/25 | Exam 2 | Quiz | 100 |
| 11/14/25 | Lecture Quiz: Nanoelectronics (Theory, OLEDs, and Organic Solar Cells) | Quiz | 100 |

| Due Date | Assignment Name | Assignment Type | Points |
|---|---|---|---|
| 11/14/25 | Lecture Quiz: Nanofabrication Techniques | Quiz | 100 |
| 11/14/25 | Lecture Quiz: Nanofabrication Techniques (Soft Lithography) | Quiz | 100 |
| 11/14/25 | Lecture Quiz: Nanoscale Characterization (AFM) | Quiz | 100 |
| 11/14/25 | Lecture Quiz: Nanoscale Characterization (SEM) | Quiz | 100 |
| 11/14/25 | Reading Quiz - Chapter 7: Nanoscale Characterization | Quiz | 100 |
| 11/14/25 | Reading Quiz - Chapter 8: Nanofabrication Techniques - Part I | Quiz | 100 |
| 12/7/25 | Weekly Nano News - Photolithography | Assignment | 100 |
| 12/12/25 | Lecture Quiz: Nanofabrication (Photolithography) | Quiz | 100 |

| Due Date | Assignment Name | Assignment Type | Points |
|---|---|---|---|
| 12/12/25 | Reading Quiz - Chapter 8: Nanofabrication Techniques - Part II (Photolithography) | Quiz | 100 |
| 12/12/25 | GE Reflection 1 | Assignment | 100 |
| 12/12/25 | GE Signature Assignment 2 | Assignment | 100 |
| 12/18/25 | Final Exam | Quiz | 100 |

## Brief Description of Assignments/Exams

**Important Dates:**

Please visit the following website for the complete academic calendar. Pay particular attention to add, drop, and withdraw dates.

http://www.slcc.edu/academiccalendar/index.aspxLinks to an external site.

**Lecture and Assignment Information:**

Video lectures, associated PowerPoint files, and assignments can be accessed by clicking on the appropriate weekly module.

**Quizzes:**

You need to complete open book and open notes quizzes for each major topic. You can access the lecture and reading quizzes by clicking on the appropriate weekly module.

**Exams:**

You will have two chapter exams and a cumulative final exam. All exams, including the final, will be open notes and open book. Study guides listing exam topics are located in the exam modules. Click on the exam reminders link to open the study guides. You will

have a testing window from 8 am to 11:59 pm Monday - Friday during the designated exam week.  However, once you open the exam, you have two hours to complete it.

Exam 1 - June 30th - July 7th

Exam 2 - July 21st - July 25th

Final Exam - August 4th - August 9th

**Participation:**

Each week I will post a news article related to the lecture topic.  To receive participation credit, upload a half-page summary relating three concepts from weekly lecture to the information presented in posted article.

**Signature Assignments:**

Signature Assignment #1 – Nanoscience/Nanotechnology Paper

Choose a current topic in nanoscience or nanotechnology type a five page (double spaced) summary paper (References, Figures, and Title page do not count toward the 5 pages). The paper should address the following criteria:

- Provide a definition for the topic selected.
- Provide three fundamental concepts associated with the topic selected. Be sure to explain how each fundamental concept is related to the topic.
- How does the topic selected benefit society or advance science?
- Provide 3 references from an academic peer reviewed journal related to your topic. You may have as many additional references.
- Include abstracts for peer-reviewed references.
- Use headers for each major section, 12 pt Times New Roman font, double-spaced.

The nanoscience/nanotechnology paper is due 11:59 Friday, July 21st as stated in the timeline.

Signature Assignment #2 – Nanotechnology Research Bulletin

Conduct online and literature searchers to find a nanoscience or nanotechnology related research project that is currently under way. Prepare a 10 slide Power Point presentation about the research you select. Title and reference slides do not count towards the 10 slide count.

Adhere to the following guidelines:

- State the objectives of the research. What are the researchers trying to determine?
- List current discoveries.
- What are the future plans of the research?
- List and define one fundamental science concept (from biology, chemistry, or physics) mentioned in the research.
- Include at least one relevant graphic in your Power Point presentation.
- List the sources on one of your Power Point slides.
- The presentation must be in Power Point format.

The PowerPoint assignment is due 11:59 pm Friday, August 1st

Upload your paper and PowerPoint to your SharePoint e-portfolio by 11:59 pm Friday, August 1st.

**Additional Course Policies:**

**General Education Statement**

This course fulfills the Physical Sciences (PS) requirement for the General Education Program at Salt Lake Community College. It is designed not only to teach the information and skills required by the discipline, but also to develop vital workplace skills and to teach strategies and skills that can be used for life-long learning. General Education courses teach basic skills as well as broaden a student's knowledge of a wide range of subjects. Education is much more than the acquisition of facts; it is being able to use information in meaningful ways in order to enrich one's life. While the subject of each course is important and useful, we become truly educated through making connections of such varied information with the different methods of organizing human experience that are practiced by different disciplines. Therefore, this course, when combined with other General Education courses, will enable you to develop broader perspectives and deeper

understandings of your community and the world, as well as challenge previously held assumptions about the world and its inhabitants.

**Late Work Policy:** Students will be allowed unlocks (two assignments per unlock) . You will be given one week from request date to complete the assignment . Additional unlocks will be granted only if documentation stating extenuating circumstances (medical, legal, etc.) is presented. To request an unlock, send me an email with assignment unlock in the subject line listing the assignment(s) you need unlocked.  Used the assignment name as it appears on Canvas in your request.

**Exam Make Up:** You will be allowed one make-up for each exam that is missed. You will be given one week from the request date to make up the exam unless you have documentation stating extenuating circumstances (medical, legal, etc.). Email me a completed assignment unlock request form if you to make up an exam.

## Grading Scale

| | |
|---|---|
| Participation (Nano News) | 10 % |
| Canvas Quizzes | 20 % |
| e-portfolio assignments (Paper/PowerPoint) | 20 % |
| Chapter Exams | 25 % |
| Cumulative Final Exam | 25 % |

| Grade Breakdown: | |
|---|---|
| A | 93 – 100 |
| A- | 90 – 92 |
| B+ | 87 – 89 |
| B | 83 – 86 |
| B- | 80 – 82 |
| C+ | 77 – 79 |
| C | 73 – 76 |
| C- | 70 – 72 |
| D | 61 – 69 |
| E | <60 |

## How to Navigate to Canvas

## Institutional Policies

As members of our academic community, we would like to invite you to review the Institutional Syllabus which covers important policies and procedures. This document contains important links for students on the code of student rights and responsibilities, academic integrity, and grading policies, Title IX and other important acknowledgements. By familiarizing yourself with this information, you can help us create a safe and respectful environment for everyone.

For more information, navigate to the Institutional Policies tab on the Institutional Syllabus page.

## Learning Support and Tutoring Services

We are pleased to offer a range of tutoring and learning support services to help you achieve your academic goals. Whether you need assistance with a specific subject or want to improve your study skills, you have many options for tutoring or other support.

To learn more about the services we offer and how to access them, visit the Institutional Syllabus page under the Tutoring and Learning Support tab. We encourage you to take advantage of these resources to help you succeed in your studies. If you have any questions or would like to schedule a tutoring session, please don't hesitate to reach out to us. We are here to support you in any way we can.

## Advising and Counseling Support Services

At our institution, we are committed to supporting your academic and personal growth. That's why we offer a range of advising and counseling services to help you navigate the challenges of college life. To learn more about the resources available to you and how to access them, visit the Institutional Syllabus page under the Advising and Counseling Support Services tab. Our advising team and the support centers across campus are here to support you in achieving your goals and overcoming any obstacles you may face.

## Student Academic Calendar

As students you should be aware of all important dates in the semester, such as the day that courses begin and end, as well as the drop date and the last day to withdraw. To learn more about those dates, navigate to the Student Academic Calendar below:

SLCC Student Academic Calendar

## Weekly Schedule

The course will cover material in the order listed in the weekly schedule below.

| Week of: | Topic: |
|---|---|
| August 25th | Lecture - Introduction to Nanotechnology (Chapter 1)<br><br>Assignments:<br><br>Lecture Quiz: Introduction to Nanotechnology<br><br>Reading Quiz: Chapter 1 |
| September 1st | Lecture - Chemistry Foundations of Nanotechnology (Chapter 2)<br><br>Assignments:<br><br>Lecture Quiz: Chemistry and Physics Foundations in Nanotechnology<br><br>Reading Quiz: Chapter 2 |
| September 8th | Lecture - Physics Foundations of Nanotechnology (Chapter 3)<br><br>Assignments:<br><br>Lecture Quiz: Chemistry and Physics Foundations in Nanotechnology<br><br>Reading Quiz: Chapter 3 |
| September 15th | Molecules with Sunglasses (C60) Documentary<br><br>Lecture - Allotropic Carbon-Based Nanomaterials - C60 (Chapter 4) |
| September | Lecture - Allotropic Carbon-Based Nanomaterials - Carbon |

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|---|---|
| 22nd | Nanotubes and Graphene (Chapter 4)<br><br>Lecture - Molecule-Based Nanotechnology - DNA Nanotechnology and Self-Assembled Monolayers<br><br>(Chapter 5: 5.1 to 5.6)<br><br>Assignments:<br><br>Lecture Quiz: Allotropic Carbon-Based Nanomaterials<br><br>Reading Quiz: Chapter 4<br><br>Molecules with Sunglasses Video Quiz |
| September 29th | Lecture - Inorganic Nanomaterials (Chapter 6)<br><br>Lab: Synthesis of Gold and Silver Nanoparticles<br><br>Assignments:<br><br>Lecture Quiz: Molecule-Based Nanomaterials<br><br>Reading Quiz: Chapter 5<br><br>Lecture Quiz: Inorganic Nanomaterials<br><br>Reading Quiz: Chapter 6 |
| October 6th | Demonstration: Spectroscopy of Gold and Silver Nanoparticles<br><br>Exam 1: Thursday, October 9th<br><br>The following assignments are due 11:59 pm Friday, October 10th:<br><br>Lecture Quizzes: Introduction to Nanotechnology<br><br>Chemistry and Physics Foundations in Nanotechnology<br><br>Allotropic Carbon-Based Nanomaterials<br><br>Molecule-Based/Inorganic Nanomaterials<br><br>Reading Quizzes : |

| | |
|---|---|
| | Chapters 1-4<br><br>Chapter 5 (Part 1)<br><br>Chapter 6<br><br>Nanotechnology Paper Due 11:59 pm Friday, October 10th |
| October 13th | Microscopy Lab Demonstration<br><br>Thursday, October 16th: Fall Break - No Class |
| October 20th | Lecture 7 - Nanoscale Characterization (Chapter 7)<br><br>Assignments:<br><br>Lecture Quizzes:<br><br>Nanoscale Characterization (AFM)<br><br>Nanoscale Characterization (SEM) |
| October 27th | Lecture 8 - Nanofabrication Techniques (Chapter 8: 8.1 - 8.7)<br><br>Lecture - Soft Lithography<br><br>Lab: Microcontact Printing of Polymer Patterns<br><br>Assignments:<br><br>Lecture Quizzes:<br><br>Industrial Micro-/Nanofabrication Techniques<br><br>Nanofabrication Techniques (Soft Lithography)<br><br>Reading Quiz:<br><br>Chapter 8 - Part 1 (8.1 - 8.7) |
| November 3rd | Lecture - Nanoelectronics - Theory (4.5 and 5.7)/Nanoelectronics - OLEDs<br><br>Lecture - Nanoelectronics - Organic Solar Cells |

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|---|---|
| | Assignments:<br><br>Nanoelectronics - Theory, OLEDs, Organic Solar Cells |
| November 10th | Lab: OLED Fabrication<br><br>Thursday, November 13th: Exam 2<br><br>The following assignments are due 11:59 pm Friday, November 14th<br><br>Lecture Quizzes:<br><br>Microscopy (AFM and SEM)<br><br>Industrial Micro-/Nanofabrication<br><br>Soft Lithography<br><br>Nanoelectronics<br><br>Reading Quizzes:<br><br>Chapter 7: Nanoscale Characterization<br><br>Chapter 8: Nanofabrication Techniques - Part 1 |
| November 17th | Tuesday, November 18th: U of U Nanofab Tour<br><br>Thursday, November 20th: Industry Guest Lecture<br><br>Watch U of U Nanofabrication Video<br><br>U of U Nanofabrication Video Quiz Due 11:59 pm Friday, November 21st |
| November 24th | Photolithography Lecture - Chapter 8.8<br><br>Thursday, November 27th: Holiday - No Class |
| December 1st | Photolithography Lab<br><br>Thursday, December 4th: Industry Guest Lecture - Photolithography |
| December 8th | Nanotechnology Presentations December 9th and December 11th |

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|---|---|
| | Nanofabrication (Photolithography) Lecture Quiz Due 11:59 pm Friday, December 12th<br><br>Nanofabrication Techniques - Part 2 (Photolithography - 8.8) Reading Quiz Due 11:59 pm Friday, December 12th |
| December 15th | Final Exam Scheduled for Thursday, December 18th – 1:30 pm - 3:30 pm |