Engineering Department

ENGR 1050 - 401: Introduction to Nanotechnology

Tuesday and Thursday: 4:00 - 5:20

SI 54 - Taylorsville/Redwood Campus

Instructor Name:

Instructor Email:

Office Hours:

Textbook Information: Basic Principles of Nanotechnology, ISBN-13: 978-1138483613, ISBN-10: 1138483613

Additional Course Information:

For College policies regarding Coronavirus (Covid-19): http://www.slcc.edu/safe/c19~~.aspx~~

Course Description: Nanoscience sits at the intersection of the basic scientific disciplines. This technology has far reaching implications in healthcare, environment, business, 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.

Assignment Percentages:

Canvas Quizzes	20 %

e – portfolio assignment 1 (Paper)	20 %
e – portfolio assignment 2 (PowerPoint)	20 %
Chapter Exams	20 %
Cumulative Final Exam	20 %

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

Important Dates:

For the complete academic calendar: http://www.slcc.edu/academiccalendar/index.aspx)

Pay particular attention to add, drop, and withdraw dates.

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:

There will be two chapter exams and a cumulative final exam. You will complete the chapter exams and the final exam in class on the designated dates listed below. You may use a single 3 x 5 notecard (back and front) on all exams. A study guide listing exam materials is located in each exam module.

Exam 1 - Tuesday, February 22nd

Exam 2 - Tuesday, April 11th

Final Exam - Thursday, May 2nd

3:40 pm - 5:40 pm

Additional Assignments:

e-Portfolio 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, March 1st as stated in the timeline.

e-Portfolio Assignment #2 – Student Presentations

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?
- What have the researchers discovered so far?
- 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.

In-class presentations will take place April 23rd and 25th. Upload the PowerPoint to Canvas by 11:59 pm Friday, April 26th.

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.

General Education e-Portfolio: Students in general education courses are required to maintain a General Education e-portfolio. For detailed information including a Student e-Portfolio Handbook, video tutorials for each e-Portfolio platform, classes, locations, and times of free workshops and other in person help, visit **http://www.slcc.edu/gened/eportfolio**

Late Work Policy: Students will be allowed unlocks for **two assignments only** . 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. Email me with *assignment unlock* in the subject line if you need an assignment opened.

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 with *exam make up* in the subject line if you need an assignment opened.

Content Outline: The course will cover material presented in the text in the order presented in the weekly timeline below.

Week:	**Topic:**
Week of January 8th	Lecture - Introduction to Nanotechnology (Chapter 1) Assignments: Lecture Quiz: Introduction to Nanotechnology Reading Quiz: Chapter 1
Week of January 15th	Lecture - Chemistry Foundations of Nanotechnology (Chapter 2) Assignments: Lecture Quiz: Chemistry and Physics Foundations in Nanotechnology Reading Quiz: Chapter 2
Week of January 22nd	Lecture - Physics Foundations of Nanotechnology (Chapter 3) Assignments: Lecture Quiz: Chemistry and Physics Foundations in Nanotechnology Reading Quiz: Chapter 3
Week of January 29th	Review of Chemistry and Physics Concepts Molecules with Sunglasses (C_{60}) Documentary Lecture - Allotropic Carbon-Based Nanomaterials - C60 (Chapter 4)
Week of February 5th	Lecture - Allotropic Carbon-Based Nanomaterials - Carbon Nanotubes and Graphene (Chapter 4) Lecture - Molecule-Based Nanotechnology - DNA Nanotechnology and Self- Assembled Monolayers (Chapter 5: 5.1 to 5.6)

	Assignments: Lecture Quiz: Allotropic Carbon-Based Nanomaterials Reading Quiz: Chapter 4 Molecules with Sunglasses Video Quiz
Week of February 12th	Lecture - Inorganic Nanomaterials (Chapter 6) Lab: Synthesis of Gold and Silver Nanoparticles Assignments: Lecture Quiz: Molecule-Based Nanomaterials Reading Quiz: Chapter 5 Lecture Quiz: Inorganic Nanomaterials Reading Quiz: Chapter 6
Week of February 19th	Demonstration: Spectroscopy of Gold and Silver Nanoparticles Exam 1: Thursday, February 22nd The following assignments are due 11:59 pm Friday, February 23rd: Lecture Quizzes: Introduction to Nanotechnology Chemistry and Physics Foundations in Nanotechnology Allotropic Carbon-Based Nanomaterials Molecule-Based/Inorganic Nanomaterials Reading Quizzes : Chapters 1-4 Chapter 5 (Part 1) Chapter 6
Week of February 26th	Lecture 7 - Nanoscale Characterization (Chapter 7) Assignments: Lecture Quizzes: Nanoscale Characterization (AFM)

	Nanoscale Characterization (SEM) Reading Quiz: Chapter 7 Nanotechnology Paper Due 11:59 pm Friday, March 1st
Week of March 4th	Spring Break
Week of March 11th	Microscopy Lab Demonstration Lecture 8 - Nanofabrication Techniques (Chapter 8: 8.1 – 8.7) Assignments: Lecture Quizzes: Industrial Micro-/Nanofabrication Techniques Nanofabrication Techniques (Soft Lithography) Reading Quiz: Chapter 8 - Part 1 (8.1 - 8.7)
Week of March 18th	Lecture - Soft Lithography Lab: Microcontact Printing of Polymer Patterns
Week of March 25th	Lecture - Nanoelectronics - Theory (4.5 and 5.7) Lecture - Nanoelectronics - OLEDs Assignments: Nanoelectronics - Theory, OLEDs, Organic Solar Cells
Week of April 1st	Lecture - Nanoelectronics - Organic Solar Cells Lab: OLED Fabrication Assignments: Nanoelectronics - Theory, OLEDs, Organic Solar Cells
Week of April 8th	Tuesday, April 9th: Exam 2

	Thursday, April 11th: Lecture - Nanofabrication Techniques - Photolithography (Chapter 8.8) The following assignments are due 11:59 pm Friday, April 12th Lecture Quizzes: Microscopy (AFM and SEM) Industrial Micro-/Nanofabrication Soft Lithography Nanoelectronics Reading Quizzes: Chapter 7: Nanoscale Characterization Chapter 8: Nanofabrication Techniques - Part 1
Week of April 15th	Tuesday, April 16th: Lab - Photolithography Thursday, April 18th: U of U Nanofab Tour Assignments: Nanofabrication (Photolithography) Lecture Quiz Due 11:59 pm, Friday, April 26th Nanofabrication Techniques - Part 2 (Photolithography - 8.8) Reading Quiz Due, Friday, April 26th Watch U of U Nanofabrication Video U of U Nanofabrication Video Quiz Due 11:59 pm Friday, April 26th
Week of April 22nd	Nanotechnology PowerPoint Presentations April 23rd and April 25th Nanotechnology PowerPoints Due 11:59 pm Friday, April 26th
Week of April 29th	Thursday, May 2nd: Cumulative Final Exam

	3:40 pm - 5:40 pm

Students with Disabilities, Emergency Procedures, and other Relevant College Policies:

Please refer to the Institutional Syllabus page for important information.

https://slcc.instructure.com/courses/530981/pages/institutional-syllabus

Dropping the Course:

If you decide for any reason to discontinue this class, you must go through the process of dropping the class with SLCC. I cannot and will not do it for you. If you stop submitting work and do not drop the class, I am required to give you a grade based on the limited amount of work you have submitted, which could result in an "E".

Academic Dishonesty:

Academic dishonesty will not be tolerated. Evidence of cheating or plagiarism will result in a score of zero for the assignment. A second offense will result in an E for the course grade. The same penalties will apply to anyone assisting the cheating efforts of others. Possession of outside materials, notes, communication devices, etc. during an exam without permission of the instructor is considered cheating.

College-Wide Learning Outcomes:

The Core Themes of SLCC's Mission focus on Access and Success, Transfer Education, Workforce Education and Community Engagement. As such, all courses and programs address one or more of the below College-Wide Learning Outcomes. Upon successful completion of any program at SLCC, students should:

1. Acquire substantive knowledge in the discipline of their choice sufficient for further study, and/or demonstrate competencies required by employers to be hired and succeed in the workplace.
2. Learn to communicate effectively.
3. Develop quantitative literacies necessary for their chosen field of study.
4. Learn to think critically.
5. Develop the knowledge and skills to be civically engaged, and/or to work with others in a professional and constructive manner.

Course Learning Outcomes:

1. Students will utilize fundamental physical science principles to explain the unusual chemical, optical, mechanical, and electrical properties observed with nanoscale materials.

2. Students will investigate current applications of nanotechnology in engineering, chemistry, physics, and biology.

3. Students will describe the tools and process used to create nanomaterials.

4. Students will identify tools and processes used in nanoscale fabrication during a visit to the University of Utah's Nanofab facility.

5. Students will differentiate between realistic outcomes achievable with nanotechnology and the speculative outcomes described in science fiction.

6. Students will evaluate the promises and dangers of nanotechnology.

7. Students will demonstrate proficiency in the use of the Markosian Library online database to obtain published scientific information for inclusion in research papers and class presentations.

8. Students will execute six hands-on laboratory investigations and compare results to the nanoscale topics discussed in lecture.

Important Resources for Students:

Please review the Institutional Syllabus page for a complete listing of available College resources.

https://slcc.instructure.com/courses/530981/pages/institutional-syllabus (https://slcc.instructure.com/courses/530981/pages/institutional-syllabus)

Tutoring (https://www.slcc.edu/tutoring/index.aspx) : index of all tutoring resources.

https://www.slcc.edu/tutoring/index.aspx (https://www.slcc.edu/tutoring/index.aspx)

STEM Learning Centers (https://www.slcc.edu/stem/index.aspx) : Provide free assistance in Math, Science, Accounting, CSIS and Allied Health Classes at 6 campus locations.

https://www.slcc.edu/stem/index.aspx (https://www.slcc.edu/stem/index.aspx)