Nano II

ENGR2050 001

Instructor Information

Phone:
Email:
Office Location:
Office Hours

Course Description

This course examines the physical properties of nanomaterials such as metal nanoparticles, nanowires, thin films, and carbon nanotubes. This course also explores nanofabrication processes that utilize wet chemical and industrial techniques.

Pre-Requisite(s): MATH 1050 with C grade or better, or appropriate placement score and ENGR 1050 with C grade or better.
Semester(s) Taught: Fall

Course Student Learning Outcomes

- Students will examine physical properties of nanomaterials such as surface energy, chemical potential, electrostatic stabilization, and steric stabilization and compare

the roles of each property in nanomaterial synthesis.

- Students will examine chemical processes used in nanomaterial synthesis including the Turkevich method and template-based electrodeposition and recognize the importance of key chemicals used in the processes.
- Students will examine the basic operation of industrial, nanofabrication techniques such as physical vapor deposition (PVD), chemical vapor deposition (CVD), and photolithography and identify the techniques used for carbon nanotube formation, thin film deposition, and patterning films.
- Students will execute nanomaterial synthesis labs using wet chemical techniques and examine the size and shape of the resulting nanomaterials using scanning electron microscopy (SEM) and UV-VIS spectroscopy.
- Students will utilize the chemical vapor deposition (CVD) furnace and the photolithography station to demonstrate proficiency in synthesizing nanomaterials using industrial techniques.

Course Prerequisites

Communication Plan

Example language:

I will respond to email within 24 hours

You will receive immediate feedback via the associated online management system when you submit Canvas assignments.

I will return exams approximately one-week after the test date

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. Attend class, take notes, and participate in class activities. Complete all your assignments, and do your best.

2. Read and study the lecture notes, 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: Nanostructures and Nanomaterials - Synthesis, Properties, and Applications (2nd Edition)
Subtitle: Recommended Text
ISBN: 978-9814324557
Authors: Guozhong Cao and Ying Wang
Publisher: World Scientific

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

Brief Description of Assignments/Exams

Lecture and Assignment Information:

PowerPoint lectures, Canvas quizzes, and post-lab quizzes can be accessed by clicking on the appropriate weekly module.

Chapter Quizzes and Post-Lab Quizzes: Will be administered through Canvas. You are allowed to use the textbook, PowerPoint lectures, and notes while completing chapter and post-lab quizzes.

Exams: There will be two in-class exams and a final exam. Exams will be administered in the testing center. The exams are closed book and closed notes. A 3 in x 5 in notecard is allowed.

Exam Make Up: You will be allowed one make-up for each exam that is missed.

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. Email me with assignment unlock in the subject line if you need an assignment opened.

Assignment Schedule

Due Date	Assignment Name	Assignment Type	Points
	Introduce Yourself	Discussion	0
12/14	ENGR 2050_Final Exam (Remotely Proctored)	Quiz	100
9/20	Chapter 2: Physical Chemistry of Solid Surfaces	Quiz	100
9/20	ENGR 2050_Exam 1	Quiz	100
9/20	Chapter 3: Zero-D Nanostructures: Nanoparticles	Quiz	100

Due Date	Assignment Name	Assignment Type	Points
9/27	Synthesis of Silver Nanoprisms_Post-Lab Quiz	Quiz	100
11/1	Chapter 4: One-D Nanostructures: Nanowires and Nanorods	Quiz	100
11/1	Chapter 5: Two-D Nanostructures: Thin Films	Quiz	100
11/1	Electrodeposition of Nickel Nanowires_Post-Lab Quiz	Quiz	100
11/1	ENGR 2050_Exam 2	Quiz	100
11/1	Synthesis of Carbon Nanotubes with CVD_Post-Lab Quiz	Quiz	100
11/1	Chapter 6: Special Nanomaterials	Quiz	100
12/5	Chapter 7: Nanostructures Fabricated by Physical Techniques	Quiz	100

Grading Scale

Grading Criteria

Cumulative Final Exam	25 %
Two In-Class Exams	25 %

Chapter/Lecture Quizzes	25 %
Post-Lab Quizzes	25 %

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.

You can access the document by clicking on the following link:
https://slcc.instructure.com/courses/530981/pages/institutional-syllabus

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, please visit the Institutional Syllabus under the Tutoring and Learning Support tab: https://slcc.instructure.com/courses/530981/pages/institutional-syllabus. 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, please visit the Institutional Syllabus under the Advising and Counseling Support Services tab: https://slcc.instructure.com/courses/530981/pages/institutional-syllabus. 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

Course Timeline

Week of:	**Topic:**
August 19th	Chapter 1: Introduction (1.1 - 1.5)
August 26th	Chapter 2: Physical Chemistry of Solid Surfaces (2.1 - 2.5)
September 2nd	Monday September 2nd - Holiday - No Class Chapter 3: Zero-Dimensional Nanostructures/Nanoparticles (3.1 - 3.2)
September 9th	Lab: Synthesis of Silver Nanoprisms with Variable Size (Synthesis and Imaging)
September	Exam 1

16th	Chapter Quizzes (1-3) and Post-Lab Quizzes Due by 11:59 pm Friday, September 20th Chapter 4: One-Dimensional Nanostructures: Nanowires and Nanorods (4.1 - 4.2)
September 23rd	Chapter 4: One-Dimensional Nanostructures: Nanowires and Nanorods (4.1 - 4.2) Lab: Template-Assisted Electrodeposition of Nickel Nanowires (Synthesis)
September 30th	Chapter 5: Two-Dimensional Nanostructures: Thin Films (5.1 - 5.5, 5.8)
October 7th	Chapter 6: Special Nanomaterials (6.1 - 6.3)
October 14th	Lab: Synthesis of Carbon Nanotubes with CVD (Nanotube Furnace) Furnace Setup (10/14) - Synthesis (10/16)
October 21st	Lab: SEM and TEM Imaging of Nickel Nanowires and Carbon Nanotubes
October 28th	Exam 2: Chapters 4 - 6 Chapter Quizzes (4-6) and Post-Lab Quizzes Due by 11:59 pm Friday, November 1st Chapter 7: Nanostructures Fabricated by Physical Techniques (7.1 - 7.4)
November 4th	Chapter 7: Nanostructures Fabricated by Physical Techniques (7.1 - 7.4)
November 11th	Lab: Photolithography Prep
November 18th	Lab: Photolithography (Substrate Preparation 11/19 - Exposure 11/21)
November 25th	Lab: Photolithography (Characterization) No Class - Thanksgiving Holiday (11/28 - 11/30)
December 2nd	Exam Review
December 9th	Final Exam Scheduled for Monday, December 9th 1:30 - 3:30