SLCC

Engineering Department

MSE 2330-401 - Introduction to Scanning Electron Microscopy

[redacted]

Email:

Office Hours:

Textbook Information:

Required textbook:

1. Scanning and Transmission Electron Microscopy: An Introduction - Stanley L. Flegler, John W. Heckman, Jr., Karen L. Klomparens

ISBN-13: 978-0195107517
ISBN-10: 0195107519

Suggested textbooks:

2. Scanning Electron Microscopy and X-Ray Microanalysis - Joseph Goldstein, Dale Newbury, David Joy, Charles Lyman, Patrick Echlin, Eric Lifshin, Linda Sawyer, and Joseph Michael

ISBN: 0-306-47292-9

3. A Practical Guide to Transmission Electron Microscopy Volume I - Fundamental - Zhigping Luo

ISBN-13: 978-60650-703-2

Covid-19 Policies: For the most recent Covid-19 information, visit the College's Covid-19 information page - **http://www.slcc.edu/safe/c19.aspx (http://www.slcc.edu/safe/c19.aspz)**

SLCC Syllabus Statement on Face Coverings

Salt Lake Community College is committed to face coverings as a way to protect everyone on campus. Until further notice, SLCC is following the Salt Lake County Health Department public health order requiring everyone to wear face coverings indoors (including the classroom) and when queueing outdoors in public (from January 8th to February 7th). When we wear face coverings, we're protecting ourselves and others. Masks are available at campus information desks. More information on face coverings can be found on **SLCC's COVID-19 webpage (https://www.slcc.edu/safe/c19.aspx#mask)** .

Students who choose not to wear a face covering are encouraged to take Online or Broadcast/Internet Lecture courses.

Note that some students may qualify for accommodations through the Americans with Disabilities Act (ADA). If you think you meet these criteria and desire an exception to the face covering policy, contact the **Disability Resource Center (http://www.slcc.edu/drc/index.aspx)** (DRC).

Course Description: This course introduces students to the use of the Scanning Electron Microscope, in both standard and EDS mode. Includes both theory and practical applications.

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

Grading Criteria

(25%) Cumulative Final Exam

(25%) Two In-Class Exams

(20%) Chapter/Lecture Quizzes

(15%) Post-lab Quizzes

(15%) Practicum

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.aspx

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.

Labs: During the first week of class, you will select a lab time used for the entire semester. The microscopy lab technician will facilitate the lab sessions with you.

Lab Attendance: If you need to miss a remote lab session, please contact the microscopy lab technician a day in advance of the intended absence. You are responsible for providing notice of your absence. There will be no penalty for unexpected absences confirmed with appropriate documentation. Unexcused absences will result in a 10 point deduction on your post-lab grade.

Exams: There will be two in-class exams and a final exam.

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.

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.

Timeline

Tuesday, January 11th Course Expectations/Chapter 1 - Overview of Electron Microscopy	**Thursday, January 13th** Lab: Overview of Lab Procedures/Lab Calendar
Tuesday, January 18th Chapter 1 - Overview of Electron Microscopy	**Thursday, January 20th** Lab: SEM Standard Operating Procedures (TM 3000)
Tuesday, January 25th Chapter 2 - Electron Sources and Electron Lenses	**Thursday, January 27th** Lab: SEM Standard Operating Procedures (LVEM5)
Tuesday, February 1st Chapter 2 - Electron Sources and Electron Lenses	**Thursday, February 3rd** Lab: Review of SEM Standard Operating Procedures - Supervised Independent Practice (TM 3000)
Tuesday, February 8th Chapter 3 - Vacuum Systems	**Thursday, February 10th** Lab: Review of SEM Standard Operating Procedures - Supervised Independent Practice (LVEM5)
Tuesday, February 15th Chapter 7 - Specimen Preparation for SEM (Sputter Coater and Critical Point Dryer	**Thursday, February 17th** Lab: Specimen Preparation of Non Conductive Samples (Sputter Coater)

Operation)	
Tuesday, February 22nd Chapter 5 - The Scanning Electron Microscope	**Thursday, February 24th** Lab: Varying Acceleration Voltages for Surface Details
Tuesday, March 1st Exam 1 (Chapters 1-3, 7)	**Thursday, March 3rd** No Lab
Tuesday, March 8th No Class - Spring Break	**Thursday, March 10th** No Class - Spring Break
Tuesday, March 15th Chapter 8 - X-Ray Analysis - Part I: X-Ray Production and Detection	**Thursday, March 17th** Lab: Elemental Mapping (TM 3000)
Tuesday, March 22nd Chapter 8 - X-Ray Analysis Part II: Spectrum Interpretation	**Thursday, March 24th** Lab: EDS Analysis of Nickel and Silver Nanowires - Spectrum Analysis
Tuesday, March 29th Chapter 8 - X-Ray Analysis Part III: Quantitative EDS	**Thursday, March 31st** Lab: EDS Quantitative Analysis

Tuesday, April 5th Chapter 4 - The Transmission Electron Microscope - Part I: Operation and Main Components	**Thursday, April 7th** Lab: TEM Standard Operating Procedures (LVEM5) with Carbon Nanotubes
Tuesday, April 12th Chapter 4 - The Transmission Electron Microscope - Part II: Imaging Parameters	**Thursday, April 14th** TEM Imaging (LVEM5) w/ 40x Objective
Tuesday, April 19th Exam 2 (Chapters 4 and 8)	**Thursday, April 21st** Open Imaging/Practicum Preparation
Tuesday, April 26th SEM/TEM Practicum	**Thursday, April 28th** SEM/TEM Practicum
Tuesday, May 3rd N/A	**Thursday, May 5th** Final Exam: 1:30-3:30

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

Please refer to the institutional syllabus for important College policies: **Institutional Syllabus (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 forthe 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.

Important Resources for Students: Please review the Institutional Syllabus page for a complete listing of available College resources.

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

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

STEM Learning Centers - **https://www.slcc.edu/stem/index.aspx (https://www.slcc.edu/stem/index.aspx)**

Provide free assistance in Math, Science,Accounting, CSIS and Allied Health Classes at 6 campus locations.

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 andconstructive manner.

MSE 2330 Student Learning Outcomes:

Students will identify the major SEM and TEM components including vacuum pumps, electron guns, condenser lenses, objective lenses, scanning coils, stigmator coils, and detectors and recognize how each component affects basic microscope operation.

Students will recognize the significance of SEM and TEM imaging parameters including acceleration voltage, spot size, aperture diameter, focus, and magnification and identify the effects of each

parameter on image quality.

Students will examine the basic operation of EDS (x-ray analysis) systems to identify the components in the system responsible for detection and processing of x-ray signals.

Students will interpret EDS (x-ray) spectrum to identify elements present in a sample.

Students will operate SEM and TEM systems during weekly, hands-on training sessions to demonstrate proficiency in the utilization of electron microscopy systems.