

EMA6507: Scanning Electron Microscopy

Summer C 2019

3 Credits

Classroom location: CSE E107

Meeting times: Tuesday and Thursday, period 4 (12:30 a.m. – 1:45 p.m.). Period 4 on Thursdays may be used for some make-up lectures and extra time for exams

Instructor information

Dr. David Hays

Office location: 104 Nanoscale Research Facility (building #0070)

Office phone: (352) 273-2286

E-mail: dhays@ufl.edu (preferred contact method)

Office hours: by appointment only

Class website: run through e-learning in canvas at <http://elearning.ufl.edu/>

Class Description & Goals:

This course will provide a foundation in the principles and theories of microscopy with a main emphasis on Scanning Electron Microscopy (SEM). The purpose of the class is to provide the necessary theoretical background to become an effective user of a SEM.

Content:

- Electron microscopy basics
- Vacuum systems and electron sources used in SEM
- Electromagnetic lenses
- Electron-sample interactions
- Backscatter electron yield
- Secondary electron yield
- Electron detectors and operation
- Compositional, topographical, and channeling contrast mechanisms
- The SEM image formation process
- High-resolution SEM imaging
- Sample preparation, contamination and environmental (low-vacuum) SEM
- Electron backscattered diffraction analysis
- Energy dispersive spectroscopy
- Wavelength dispersive spectroscopy
- Auger electron spectroscopy
- Cathodoluminescence

Tentative Schedule

	Week	Tuesday	Thursday	Schedule
May	1	14		Lecture 1
			16	Lecture 2
	2	21		Lecture 3
			23	Lecture 4
	3	28		Lecture 5
			30	Lecture 6
June	4	4		Review
			6	Exam
	5	11		Lecture 7
			13	Lecture 8
	6	18		Lecture 9
			20	Lecture 10
	7	Break 25-29		
July	8	2		No class
			4	Holiday
	9	9		Review
			11	Exam
	10	16		Lecture 11
			18	Lecture 12
	11	23		Lecture 13
		25	Lecture 14	
12	30		Lecture 15	
August	13		2	Lecture 16
		6		Review
			8	Exam

Assessments:

Three (3) in-class mid-term exams (1/3 of final score for each mid-term exam)

Each mid-term exam will consist of, roughly, 20-25 equally weighted multiple choice questions and will not be explicitly cumulative in nature; the use of a multiple choice format is to remove the ambiguity and fairness issues that tend to accompany the grading of essay/extended answer questions.

There will be an entire lecture dedicated for review before each exam. I will provide summary slides of what will be on the exam, so bring your questions!

You may bring a **handwritten** 8.5x11 inch sheet of paper to each exam. Anything photocopied will be confiscated.

Tentative mid-term exam dates: June 6th, July 11th, August 9th

Grading:

90% ≤ A

90% > A- ≥ 87%

87% > B+ ≥ 84%

84% > B ≥ 80%

80% > B- ≥ 77%

77% > C+ ≥ 74%

74% > C ≥ 70% (lowest possible passing grade)

Recommended Text

“Scanning electron microscopy and X-ray microanalysis” by Goldstein *et al.*; third edition (ISBN: 978-1-4613-4969-3)

Class Attendance:

Attendance and active participation at all scheduled lectures is required.

Special Accommodations:

Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

University's Honesty Policy:

Students are responsible for reading and abiding by the University's honesty policy regarding cheating and use of copyrighted materials. Details of the honesty policy maybe found at <http://www.dso.ufl.edu/stg/>.

Software Use:

All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

UF Counseling Services:

Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.