Marshall University Syllabus
College of Science
Forensic Science Graduate Program

Course

FSC 612 Introduction to Forensic Microscopy

Course Description

Introduction to various types of microscopy used in forensics, with emphasis on polarized light microscopy (PLM) and scanning electron microscopy (SEM).

Credits
2 Graduate Credits

Prerequisites
Admission to the Forensic Science Graduate Program

Term/Year

Fall 2024

Class Meeting Days/Times

Tuesdays and Thursdays from 8:00 AM to 11:00 AM (unless stated otherwise)

Location

Forensic Science Center Annex classroom 115 and Science building room 200B

Academic Calendar

For beginning, ending, and add/drop dates, see the Marshall University Academic Calendar (URL: https://www.marshall.edu/academic-calendar/).

Instructor

Dr. Kimberly S. Kunkler

Contact Information

- Office: Forensic Science Center Annex A225
- Office Hours: Tuesdays & Thursdays 1 – 3 PM; Wednesdays 2:30 – 3:30 PM, and by appointment
- Office Phone: 304-733-7864
- Marshall Email: kunkler@marshall.edu

Health and Safety Information

All members of the Marshall University community are expected to always observe health and safety protocols. This includes general health and safety protocols as well as specific protocols that might emerge in response to community and campus health conditions.

Campus Carry Policy

University Policy, UPGA-12 (Campus Carry Policy) derives its authority from West Virginia State law, including the Campus Self-defense Act (W. Va. Code § 18B-4-5b). It pertains to the exercise of Concealed Carry on Marshall University's campus, except in designated areas, by individuals with a valid permit to Conceal Carry.

Individuals who choose to Conceal Carry are responsible for knowing and understanding all applicable federal, state, and local laws and Marshall University Board of Governors Rules, University Policies, and Administrative Procedures. University Policy, UPGA-12 applies to areas of campus and buildings that are directly under the possession or control of Marshall University.

Concealed Handguns are not observable to others and must be holstered and concealed on the body of the permit holder or in a personal carrier, such as a backpack, purse, or other bag that remains under the exclusive and uninterrupted control of the permit holder. This includes wearing the personal carrier with a strap, carrying or holding the personal carrier, or setting the personal carrier next to or within your immediate reach at all times. If your participation in class activities impedes your ability to maintain constant control of your Handgun, please make alternate arrangements prior to coming to class.

Required and/or Recommended Texts and Materials

Required Texts and Materials

None

Recommended/Optional Texts and Materials

Bell, S.; Morris, K. (2010) *An Introduction to Microscopy*. CRC Press: Boca Raton, FL.

McCrone, W.C.; McCrone, L.B.; Delly, J.G. (2005) *Polarized Light Microscopy*. McCrone Research Institute: Chicago, IL. (copies available in Program library)

Postek, M.T.; Howard, K.S.; Johnson, A.H.; McMichael, K.L. (1980). *Scanning Electron Microscopy: A Student's Handbook*. Ladd Research Industries: Williston, VT. (copies available in Program library)

Excerpts from relevant ASTM standards will be referenced and made available for personal use and study by the students during this course.

Course Student Learning Outcomes

The table below shows the following relationships: How each student learning outcome will be practiced and assessed in the course.

Course student learning outcomes	How students will practice each outcome in this course	How student achievement of each outcome will be assessed in this course
Students will review published, consensus-based standards and define basic terminology related to forensic microscopy	Class discussions, in-class exercises	PLM Theory Questions SEM Theory Questions PLM Exam SEM Exam PLM Project Report SEM Presentation
Students will articulate the strengths and weaknesses of various techniques involved in forensic microscopy	Class discussions, in-class exercises	PLM Theory Questions SEM Theory Questions PLM Exam SEM Exam PLM Project Report SEM Presentation
Students will apply quality assurance and quality control practices related to forensic microscopy	Class discussions, in-class exercises	PLM Project Report SEM Presentation
Students will prepare appropriate responses for testimony questions related to forensic microscopy	Class discussions, in-class exercises	PLM Theory Questions SEM Theory Questions PLM Project Report SEM Presentation
Students will identify the parts of the polarized light microscope, describe their purpose or function, demonstrate how to align the light path, and calibrate the ocular scale	Class discussions, in-class exercises, filling out a "Parts of the PLM" worksheet	PLM Theory Questions PLM Exam PLM Project Report
Students will relate observed physical and optical properties of natural and synthetic materials to their structural and compositional properties	Class discussions, in-class exercises using known materials	PLM Theory Questions PLM Exam PLM Project Report
Students will observe, evaluate, and interpret physical and optical properties of unknown materials to deduce their probable identity	Class discussions, in-class exercises using known and unknown materials	PLM Project Report
Students will identify the parts of the scanning electron microscope and describe their purpose or function	Class discussions, in-class exercises	SEM Theory Questions SEM Exam SEM Presentation

Course student learning outcomes	How students will practice each outcome in this course	How student achievement of each outcome will be assessed in this course
Students will differentiate between the types of signals that are generated during primary beam and sample interaction and describe the information each can provide	Class discussions, in-class exercises	SEM Theory Questions SEM Exam SEM Presentation
Students will develop skills in obtaining images using a scanning electron microscope	Small groups working on projects during class time	SEM Presentation
Students will develop skills in determining elemental chemical information using energy dispersive X-ray spectroscopy	Small groups working on projects during class time	SEM Presentation

Course Requirements/Due Dates

The following abbreviations are used: PLM = polarized light microscopy, SEM = scanning electron microscopy.

Assignment	Points Toward Final Grade	Due Date
PLM Exercises (8 total)	16	At end of class during which it was assigned; see course schedule for details
PLM Theory Questions	10	9/19/2024
PLM Project Report	14	10/01/2024
PLM Exam	20	10/03/2023
SEM Theory Questions	10	11/07/2024
SEM Presentation	10	12/03/2024
SEM Exam	20	12/05/2024

Total Points Possible: 100

NOTE: There are 8 PLM Exercises, each of which will be assigned points as follows:

2 points = present during class time and skill/understanding of concept(s) successfully demonstrated

1 point = present during class time but skill/understanding of concept(s) needs improvement

0 points = not present during class time or did not attempt to develop skill/understanding of concept(s)

Grading Policy

Grading Scale: A = 90 to 100 points
B = 80 to 89 points
C = 70 to 79 points
D = 60 to 69 points
F = 0 to 59 points

Partial Credit Policy: Partial credit amounts to both give and take; students can earn partial credit for the correct portions of an answer, but they can also lose partial credit for adding incorrect or misleading information to an otherwise fully correct answer.

Late Grading Policy: A 10% deduction will be taken for every day an assignment is late.

Attendance/Participation Policy

Attendance is Mandatory: Students enrolled in the Forensic Science Program are expected to attend all classes, laboratories, seminars, internship sessions, and guest speaker presentations. Should you need to miss classes due to an excused absence or other situation governed by the official health or safety policy, appropriate accommodation will be provided.

Excused Absences: Both notification and formal documentation are required for Excused Absences. No exams, labs, or other formal exercises will be made up without an Excused Absence. With an Excused Absence, the student may be asked to take an exam BEFORE the scheduled date.

Unexcused Absences: Any unexcused absence during which a student misses a graded activity or assignment identified in this syllabus may result in a zero for the activity or assignment.

Punctuality: On-time arrival is expected of all students. A deduction of 20 points will be made if a lack of punctuality is persistent (more than 3 times during the semester).

Generative Artificial Intelligence (AI) Policy for Use in the this Course

Students are allowed to use Generative AI in some ways but are prohibited from using it in other ways. Keep in mind that any content produced by generative AI can "hallucinate" (produce false information), so students are responsible for ensuring the accuracy of any AI-generated content. For information on citing AI, please see MU Library's citation website (URL: https://libguides.marshall.edu/plagiarism-AI/cite). Students should not use generative AI in any way that would violate the Student Code of Conduct (URL: https://www.marshall.edu/student-conduct/files/Student-Code-of-Conduct-2023.pdf).

Students ***are permitted*** to use generative AI in the following ways:

- ***Brainstorming***: You may use generative AI to stimulate creativity, generate ideas, or brainstorm topics for papers, presentations, and discussions. The generated content must serve as a stepping stone, not a final product.
- ***Citation Assistance***: AI tools can be used to manage, format, and organize citations and references, promoting adherence to academic writing standards and specific style guides required for individual assignments.

- ***Grammar and Style Checking***: AI-powered writing enhancement tools may be used to help with spelling, grammar, syntax, and stylistic errors.
- ***Concept Understanding***: Generative AI can be used to explain, enhance, or simulate concepts taught in class, aiding in a deeper understanding.
- ***Research Assistance***: AI can be used to conduct initial research, compile data, and summarize articles, books, or papers. It should not replace traditional research methods but rather enhance them.

Students ***are NOT permitted*** to use generative AI in coursework in the following ways:

- ***Plagiarism***: Using AI-generated content as your original work without attribution. This includes essays, papers, presentations, and exam answers.
- ***Data Manipulation***: Using AI tools to alter data or create misleading information.
- ***Misrepresentation of Skills***: Using generative AI to complete tasks that are meant to assess your knowledge and skills.
- ***Confidentiality Breach***: Using AI tools that might violate university policies or laws related to data privacy and confidentiality.

See individual assignment instructions for additional details that may apply.

In addition to a proper citation, you should include the following statement with any assignment where generative AI is used for assistance:

"I used generative AI platform [INSERT NAME OF PLATFORM, SUCH AS CHAT GPT] for assistance in the following ways on this assignment: [INSERT WAYS USED, such as brainstorming, citation assistance, grammar and style checking, concept understanding, and research assistance, etc.]."

University Policies

By enrolling in this course, you agree to the University Policies. Please read the full text of each policy (listed below) by going to MU Academic Affairs: University Policies. (URL: https://www.marshall.edu/academic-affairs/policies/)

- Academic Dishonesty Policy
- Academic Dismissal Policy
- Academic Forgiveness Policy
- Academic Probation and Suspension Policy
- Affirmative Action Policy
- Pre-Finals Week Policy
- D/F Repeat Rule
- Excused Absence Policy for Undergraduates
- Inclement Weather Policy
- Sexual Harassment Policy- Title IX prohibits the harassment of students based on sex, which includes pregnancy, childbirth, and related conditions. This includes that students will not be penalized for taking medically necessary leave related to pregnancy, childbirth, or related conditions. Marshall's Title IX Office may be contacted at TitleIX@marshall.edu
- Students with Disabilities (Policies and Procedures)
- University Computing Services Acceptable Use Policy

Course Schedule

While every effort will be made to adhere to the following course schedule, the topics and order of presentation are subject to change based on the availability of required instrumentation. Students will be notified of any course schedule changes.

Course Schedule for FSC 612 Fall 2024:

Week	Tuesday	Thursday
1	8/20 Experience Level Evaluation PP01 Intro to LM and the PLM **PLM Theory Questions assigned**	8/22 Getting Familiar with Your PLM **Exercises 1 & 2**
2	8/27 PP02 Light Interactions **Exercise 3**	8/29 PP03 Crystal Systems **Exercise 4**
3	9/3 PP04 Observable Characteristics 1&2 **Exercise 5**	9/5 PP05 Observable Characteristics 3 **Exercise 6**
4	9/10 PP06 Sign of Elongation **Exercise 7**	9/12 PP07 Overview of Fibers Practice-Observation of Fibers
5	9/17 PP08 Overview of Hair Practice-Observation of Hair **Exercise 8**	9/19 Project Lab **PLM Theory Questions due**
6	9/24 Project Lab	9/26 Project Lab
7	10/1 PLM Exam review **PLM Project Report due**	10/3 **PLM Exam**
8	10/8 PP09 Intro to SEM **SEM Theory Questions assigned**	10/10 **NO CLASS**
9	10/15 SEM Lab – Overview & Demo Group 1 – 8:00 – 9:30 AM Group 2 – 9:30 – 11:00 AM	10/17 SEM Lab – Overview & Demo Group 3 – 8:00 – 9:30 AM Group 4 – 9:30 – 11:00 AM
10	10/22 SEM Lab – Imaging Group 1 – 8:00 – 9:30 AM Group 2 – 9:30 – 11:00 AM	10/24 SEM Lab – Imaging Group 3 – 8:00 – 9:30 AM Group 4 – 9:30 – 11:00 AM
11	10/29 SEM Lab – EDS Group 1 – 8:00 – 9:30 AM Group 2 – 9:30 – 11:00 AM	10/31 SEM Lab – EDS Group 3 – 8:00 – 9:30 AM Group 4 – 9:30 – 11:00 AM
12	11/5 SEM Lab – GSR Group 1 – 8:00 – 9:30 AM Group 2 – 9:30 – 11:00 AM	11/7 SEM Lab – GSR Group 3 – 8:00 – 9:30 AM Group 4 – 9:30 – 11:00 AM **SEM Theory Questions due**
13	11/12 SEM Lab – Your Samples Group 1 – 8:00 – 9:30 AM Group 2 – 9:30 – 11:00 AM	11/14 SEM Lab – Your Samples Group 3 – 8:00 – 9:30 AM Group 4 – 8:00 – 9:30 AM
14	11/19 SEM Lab – Your Samples Group 1 – 8:00 – 9:30 AM Group 2 – 9:30 – 11:00 AM	11/21 SEM Lab – Your Samples Group 1 – 8:00 – 9:30 AM Group 2 – 9:30 – 11:00 AM
15	11/26 **NO CLASS**	11/28 **NO CLASS**
16 (PF)	12/3 **SEM Presentations – All Groups** SEM Exam Review / Course Wrap-Up	12/5 SEM Exam
17 (F)	---	---