

FRSC 480: Forensic Microscopy
Spring 2024 Syllabus
M 11:30-3:50p (TIER 209)
W 12:15p-2:10p (FMH 305)

ACADEMIC INTEGRITY

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: [NJIT Academic Integrity Code](#).

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

STATEMENT on AI

The usage of artificial intelligence (AI) is permitted in this course. If and when you use artificial intelligence in this course, the AI must be cited as is shown within the [NJIT Library AI citation page](#) for AI.

COURSE INFORMATION

Microscopy has been a scientific technique for centuries, and its application to forensic science is an invaluable tool. This course provides students with the basic knowledge and skills necessary to explore the application of microscopy to the forensic sciences. Sample handling and procedures are specific for the forensic student/practitioner. This course incorporates lectures and laboratory exercises organized in a format to engage each student in the analytical and investigative roles of different kinds of microscopes in the forensic professions. The general topics and techniques covered in this course include microscope nomenclature, alignment and focus, trace sample handling, and identification of unknown samples. Students will become familiar with the stereomicroscope, polarized light microscope, comparison microscope, scanning electron microscope, and others.

Number of Credits: 4 **Prerequisites:** CHEM 221

COURSE SECTION AND INSTRUCTOR

Course-Section	Instructors
FRSC 480-002	David Fisher (dfisher@njit.edu)
M 11:30a-3:50p (TIER 209)	Office: Tiernan 323A
W 12:15a-2:10p (FMH 313)	Office Hours: W: 2:15-3:15p & by appt

Required Textbooks (#1 can be accessed via the hyperlink below in the NJIT ebook database):

- 1) Petraco, Nicholas and Thomas A. Kubic, [*Color Atlas and Manual of Microscopy for Criminalists, Chemists, and Conservators*](#), CRC Press, Taylor & Francis Group, BocaRaton, Florida, (2004).
- 2) Reffner, John A., and Brooke W. Kammrath, eds. *Solving Problems with Microscopy: Real-life Examples in Forensic, Life and Chemical Sciences*. John Wiley & Sons, 2023.

Required Lab Manual:

- 3) Wheeler, B. (2021). *Practical Forensic Microscopy: A Laboratory Manual (Second edition)*. Wiley ISBN: 978-1-119-15449-5

Required PPE:

Student **MUST** provide their own PPE during laboratory sessions (i.e. lab coats, gloves, and eye protection). These can be purchased in the NJIT bookstore or on Amazon. Students will not be allowed in the lab without appropriate PPE.

Learning Outcomes: Upon completion of this course, students will:

- Identify and define foundational theories of light and optics used in forensic microscopy.
- Classify different microscopes and their uses in crime laboratories, including advantages and disadvantages.
- Describe the fundamental theories of light, illumination, image formation, and aberrations of optical lenses and their correction.
- Diagram and perform the logical sequences of sample recovery, preparation and analytical study of traces.
- Classify and communicate the microscopic analysis, examinations, and interpretations of forensic trace evidence.
- Evaluate and classify hair, fibers, and other traces using optical and polarized light microscopy.
- Demonstrate the effect of different lighting conditions on image quality.
- Document specimens using digital photography, including the proper use of a scale in digital images.
- Be able to use a comparison microscope in a mock firearms case.
- Have an understanding of how the scanning electron microscope (SEM) works.
- Be familiar with other types of microscopy.

POLICIES

All CES students must familiarize themselves with, and adhere to, all official university-wide student policies. CES takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Class Participation/Attendance/Lab Safety	5%
Photomicrograph competition	5%
Quizzes	15%
Lab exercises (lab reports)	50%
Final Exam	25%

Your final letter grade in this course will be based on the following grading scale:

A	90-100	C	70-76
B+	87-89	D	60-69
B	80-86	F	<60
C+	77-79		

Attendance Policy: Attendance at classes will be recorded and is **mandatory**. Each class is a learning experience that cannot be replicated through simply “getting the notes.” After two unexcused absences, each subsequent absence will result in your class participation score being lowered by one percentage point.

Participation Grade: You are expected to read the relevant chapter(s) and/or reading assignment prior to the lecture. Students who participate in lecture by answering questions will receive points towards their class participation grade. Another component of your participation grade will be lab cleanliness. Students who do not clean up after lab, dispose of waste improperly, or do not follow safety rules will have points deducted from their participation grade.

Exams: There will be 3 quizzes throughout the semester (see syllabus for quiz dates) and one comprehensive final exam.

The final exam is cumulative and will test your knowledge of all the course material taught in the course.

Makeup Exam/Quiz Policy: There will normally be **NO MAKE-UP LABS or EXAMS** during the semester. In the event that a student has a legitimate reason for missing a lab or exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the lab or exam, e.g., a doctor’s note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Instructor that the exam/lab will be missed. The lowest lab report grade will be dropped at the end of the semester, which will accommodate 1 missed lab.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times, unless allowed by the instructor.

ADDITIONAL RESOURCES

Accommodation of Disabilities: Office of Accessibility Resources and Services offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact the Office of Accessibility Resources and Services. is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Accessibility Resources and Services (OARS) website at:

- <https://www.njit.edu/accessibility/>

Important Dates:

Date	Day	Event
Jan 21	T	First Day of Classes
Jan 27	M	Last Day to Add/Drop Classes
March 16-22	M-Sa	Spring Recess
April 7	M	Last Day to Withdraw
May 7	T	Last Day of Classes (Friday classes meet)
May 8-9	W-R	Reading Days
May 10-16	F-R	Final Exam Period

Course Outline

Week	Date	Topic	Assignment
1	Jan 22	Trace Evidence Intro & History of the Microscope	Petraco (Ch 1-2)
2	Jan 27 (lab)	Lab Safety; Lab Checkin; Camera Software	
	Jan 29	Basic Light Microscopy; Stereomicroscopy	Read Leica EZ4W manual
3	Feb 3 (lab)	Expt 1A: Familiarization with the Stereomicroscope	Lab Manual (Ch 1; Expt 1A)
	Feb 5	Comparison Microscope; Bullet examinations	Read Leica FS C Manual
4	Feb 10 (lab)	Field Trip	
	Feb 12	Quiz #1 ; Guest speaker	
5	Feb 17 (lab)	AAFS Meeting; Expt 11: Firearms Examinations	Lab Manual (Expt 11)
	Feb 19	AAFS Meeting (class will not meet)	
6	Feb 24 (lab)	Expt 11: Firearms Examinations (cont.)	Lab Manual (Expt 11)
	Feb 26	Compound Light Microscope	Lab Manual (Ch 2)
7	Mar 3 (lab)	Expt 2A-2B: Familiarization and Measurements	Lab Manual (Expt 2A & 2B)
	Mar 5	Mounting Samples & Refractive Index (RI)	Petraco (Ch 3)
8	Mar 10 (lab)	Expt 2C-2D: Mounting Techniques & RI	Lab Manual (Expt 2C & 2D)
	Mar 12	Quiz #2 ; Human Hair Examinations	Petraco (Ch5)
9	Mar 17 (lab)	Spring Break	
	Mar 19	Spring Break	
10	Mar 24 (lab)	Expt 17B-C: Human Hair Experiments	Lab Manual (Expt 17B-C)
	Mar 26	Animal Hair (Forensic Science Summit for Defense Bar)	Petraco (Ch6)
11	Mar 31 (lab)	Expt 17A: Animal Hair Examination	Lab Manual (Expt 17A)
	Apr 2	The Polarized Light Microscope	Read DM750P Manual
12	Apr 7 (lab)	Expt 3A-3C: PLM; RI; Sign of Elongation; Birefringence	Lab Manual (Expt 3A-3C)
	Apr 9	Quiz #3; Forensic Art	
13	Apr 14 (lab)	Shroud of Turin assignment (class will not meet)	
	Apr 16	Shroud of Turin assignment (class will not meet)	
14	Apr 21 (lab)	Field Trip	
	Apr 23	Fiber Examinations	Petraco (Ch 7-9)
15	Apr 28 (lab)	Expt 20A: Natural Fibers	Lab Manual (Expt 20A)
	Apr 30	TBD	
16	May 5 (lab)	Expt 20B: Man-made fibers	
	TBA	FINAL EXAM	See NJIT Final Exam schedule