Spring 2022

FRSC 480-002: Forensic Microscopy & Lab

David Fisher

NJIT New Jersey Institute of Technology

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE

FRSC 480: Forensic Microscopy

Spring 2022 Syllabus

M 1-5:20p (Lab-TIER 209)

T 1p-2:55p (Lecture-TIER 209)

https://njit.webex.com/meet/dfisher

NJIT Academic Integrity Code: Students are asked to practice extra care and attention in regards to academic honesty, with the understanding that all cases of plagiarism, cheating, multiple submission, and unauthorized collaboration are subject to penalty. Students must properly cite and attribute all sources used for papers and assignments. Students may not collaborate on exams or assignments, directly or through virtual consultation, unless the instructor gives specific permission to do so. Posting an exam, assignment, or answers to them on an online forum (before, during, or after the due date), in addition to consulting posted materials, constitutes a violation of the University's Honesty policy. Likewise, unauthorized use of live assistance websites, including seeking "expert" help for specific questions during an exam can be construed as a violation of the honesty policy. All students should be familiar with the NJIT Academic Integrity Code.

COURSE INFORMATION

Course Description: 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	Instrucuctors
FRSC 480-002	David Fisher (dfisher@njit.edu)
M 1-5:20pm (TIER 209)	Office: Tiernan 323A
T 1-2:55pm (TIER 209)	Office Hours: T: 3-4p & 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) Desiderio, Vincent, et.al., *Handbook of Trace Evidence Analysis*, Wiley & Sons, 2021.

Required Lab Manual:

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

and other readings as assigned.

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 trace evidence.
- 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.
- 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	10%
Lab exercises	40%
Midterm Exam	20%
Final Exam	30%

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 one midterm exam held in class during the semester and one comprehensive final exam. The following exam periods are tentative and therefore possibly subject to change:

Midterm Exam	Mar 8, 2022
Final Exam Period	During Finals Week

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

Makeup Exam 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 will be missed so that appropriate steps can be taken to make up the grade.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Accommodation of Disabilities: **O**ffice of **A**ccessibility **R**esources and **S**ervices (***formerly known as Disability Support 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 Chantonette Lyles, Associate Director at the Office of Accessibility Resources and Services at 973-596-5417 or via email at lyles@njit.edu. The office 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:

- http://www5.njit.edu/studentsuccess/disability-support -services/

Important Dates:

Date	Day	Event
Jan 18	T	First Day of Classes
Jan 24	M	Last Day to Add/Drop Classes
March 14-19	M-Sa	Spring Recess
April 4	M	Last Day to Withdraw
May 3	T	Last Day of Classes (Friday classes meet)
May 4-5	W-R	Reading Days
May 6-12	F-R	Final Exam Period

Course Outline

Week	Date	Topic	Assignment
1	Jan 18	Trace Evidence Intro; History of the Microscope	Handbook (Ch 1)
	Jan 24 (lab)	Lab Safety; Lab Checkin; Camera Software	Petraco (Ch 1-2)
2	Jan 25	Basic Light Microscopy; Stereomicroscopy	Read Leica EZ4W manual
	Jan 31 (lab)	**Expt 1A: Familiarization with the Stereomicroscope**	Lab Manual (Ch 1; Expt 1A)
3	Feb 1	Precious Gemstones and Diamonds	Petraco (Ch 12)
	Feb 7 (lab)	**Field Trip to US Customs & Border Patrol Lab**	
4	Feb 8	Compound Light Microscope	Lab Manual (Ch 2)
	Feb 14 (lab)	**Expt 2A-2B: Familiarization and Measurements**	Lab Manual (Expt 2A & 2B)
5	Feb 15	Mounting Samples & Refractive Index	Petraco (Ch 3)
	Feb 21 (lab)	**Expt 2C-2D: Mounting Techniques & RI**	Lab Manual (Expt 2C & 2D)
6	Feb 22	The Polarized Light Microscope	Handbook (Ch2); Read DM750P Manual
	Feb 28 (lab)	**Expt 3A-3C: PLM; RI; Sign of Elongation; Birefringence**	Lab Manual (Expt 3A-3C)
7	Mar 1	Fiber Examinations	Petraco (Ch 7-9); Handbook (Ch5)
	Mar 7 (lab)	**Expt 20B: Man-made Fibers**	Lab Manual (Ch 20; Expt 20B)
8	Mar 8	**MIDTERM**	
	Mar 14	**Spring Break**	
9	Mar 15	**Spring Break**	
	Mar 21 (lab)	**Expt 20A: Natural Fibers**	Lab Manual (Expt 20A)
10	Mar 22	Forensic Histopathology	
	Mar 28 (lab)	**Expt 28: Semen Microscopic Examinations**	Lab Manual (Expt 28)
11	Mar 29	Human Hair Examinations	Petraco (Ch5); Handbook (Ch 4)
	Apr 4 (lab)	**Expt 17B-D: Human Hair Experiments**	Lab Manual (Expt 17B-D)
12	Apr 5	Animal Hair	Petraco (Ch6)
	Apr 11 (lab)	**Expt 17A: Animal Hair Examination**	Lab Manual (Expt 17A)
13	Apr 12	Comparison Microscope; Bullet examinations	Read Leica FS C Manual
	Apr 18 (lab)	**Expt 11: Firearms Examinations**	Lab Manual (Expt 11)
14	Apr 19	Scanning Electron Microscope (SEM)	
	Apr 25 (lab)	**Expt 11A: Gunshot Residue Examination**	Lab Manual (Expt 11A)
15	Apr 26	Review for Final	
	May 2	Lab check out; Makeup labs	
Final	TBA		