Spring 2020

FRSC 480-002: Forensic Microscopy

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
M 1-5:20p (TIER 209)
W 5:45p-7:40p (TIER 209)
Spring 2020 Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Chemistry & Environmental Science (CES) takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

Course Description: Microscopy has been a scientific technique for centuries, and its application to forensics 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 learner/practitioner. This course is an integrated program that incorporates lectures, laboratory exercises, and individual research projects, organized in a format to engage each registrant 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, microscopic sample handling, and photographic documentation of samples.

Number of Credits: 4

Prerequisites: CHEM 221

Course-Section and Instructor

Course-Section	Instrucuctors	
FRSC 480-002	David Fisher (dfisher@njit.edu)	Carlos Pecheco, PhD (pacheco@njit.edu)
M 1-5:20pm (TIER 209)	Office: Tiernan 385	Office: Tiernan B006; Lab: B008
W 5:45-7:40pm (TIER 209)	Office Hours: W: 4-5pm & M: 1-2p	Office Hours: M: 10-12 PM

Required Textbooks (all textbooks can be accessed via the hyperlinks 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) Robertson, James, et.al.. *Forensic Examination of Fibres, 3rd ed*, CRC Press, Taylor & Francis Group, Boca-Raton, Florida, (2017).

3) Robertson. James. Forensic Examination of Human Hair, CRC Press, Taylor & Francis Group, Boca-Raton, Florida, (1999).

4) Caddy. Brian. *Forensic Examination of Glass and Paint: Analysis and Interpretation*, CRC Press, Taylor & Francis Group, Boca-Raton, Florida, (2001).

Required Lab Manual:

5) Wheeler, B. & Wilson, L.J. (2008). Practical Forensic Microscopy: A Laboratory Manual. Wiley ISBN: 978-0-470-03176-6.

and other readings as assigned.

Required Supplies:

You will need to purchase several supplies for use in the lab portion of this course:

Microscope Calibration Slide (**https://tinyurl.com/rt5ebrt**)
Microscope slides (**https://tinyurl.com/sm3pdro**)
Dissection kit (**https://tinyurl.com/snw79wb**)
Slide box (https://tinyurl.com/v8957wz)

University-wide Withdrawal Date: The last day to withdraw with a **W** is Monday, April 6, 2020. It will be strictly enforced.

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.
- Demonstrate the interactions of light with biological, polymeric and crystalline substances using optical microscopy.
- Classify and communicate the microscopic analysis, examinations, and interpretations of forensic trace evidence.
- Evaluate and classify hair, fibers, glass, and paint chips using optical and polarized light microscopy.
- Demonstrate the effect of different lighting conditions on image quality.
- Document specimens using digital and imaging 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:

Lab safety and cleanliness	10%
Class Participation	10%
Lab exercises	30%
Midterm Exam	20%
Final Exam	30%
Extra Credit will be given for attending AAFS, NJAFS	5% per conference
Extra Credit will be given for attending Friday FRSC Seminars	1% per seminar

IAI Photomicrograph contest	1%/entry; 10%/win

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.

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 11, 2020
Final Exam Period	TBD

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 QUIZZES OR EXAMS** during the semester. In the event that a student has a legitimate reason for missing a quiz or exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the 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 CES Department Office/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. Such devices must be turned in during exams.

ADDITIONAL RESOURCES

Accommodation of Disabilities: Office of Accessibility Resources and Services (***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 21	T	First Day of Classes
Jan 31	F	Last Day to Add/Drop Classes
March 15-22	Su-Su	Spring Recess
April 6	M	Last Day to Withdraw
May 5	T	Last Day of Classes
May 6-7	W-R	Reading Days
May 8-14	F-R	Final Exam Period

Course Outline

Week	Date	T	Assignment
1	Jan 22	Intro; Trace Evidence; Evidence ID/Handling; Light/Optics	Read Leica EZ4W manual; 1 (Ch 1-2)
	Jan 27 (lab)	Safety Lecture; Lab Check in; Stereomicroscopy	5 (Ch 1 & Expt 1A)
2	Jan 29	Intro to the Polarized Light Microscope	5 (Ch2-3); 1(Ch3)
	Feb 3 (lab)	Assemble PLMs; Familiarization of PLM	5 (Expt 2A-2D; Expt 3A-3C)
3	Feb 5	Identification and Comparison of Human Hair	1 (Ch 5); 3 (Ch 2); 5(Ch15); 1(AppA)
	Feb 10 (lab)	Human Hair Examination	5 (Expt 15, 15B-15D)
4	Feb 12	Identification of Animal Hair	1 (Ch 6, AppB)
	Feb 17 (lab)	AAFS Meeting; Animal Hair Examinations	5 (Expt 15A)
5	Feb 19	AAFS Meeting; Synthetic Fibers; textiles	5 (Ch 17); 1(Ch7,9, AppC); 2(Ch 1,2,7)
	Feb 24 (lab)	Synthetic Fiber Examination	5 (Expt 17, 17B)
6	Feb 26	Natural Fibers; textiles	1 (Ch8)
	Mar 2 (lab)	Natural Fiber Examinations and Identifications	5 (Expt 17A, 17C)
7	Mar 4	Biological Microscopy; Histology	5 (Ch 21)
	Mar 9 (lab)	Serology; Semen identification	5 (Expt 21)
8	Mar 11	Midterm	
	Mar 16	Spring Break	
9	Mar 18	Spring Break	
	Mar 23 (lab)	Shooting Range (meet in the parking lot behind Tiernan)	This “lab” will cost approx. $50
10	Mar 25	Scanning Electron Microscope (SEM)	5(Ch 25); handout
	Mar 30 (lab)	SEM demo (York Center)	5(Expt 25)

11	Apr 1	Introduction to the Comparison Microscope; Det. Winter	5 (Ch 11); handout
	Apr 6 (lab)	Comparison Microscope Lab	5(Expt 11A)
12	Apr 8	Intro to Flourescence Microscopy; Dean Kevin Belfield	5(Ch 4); handout
	Apr 13 (lab)	Flourescence Microscopy Lab Demo; Dr. Belfield's Lab	5(Expt 4A)
13	Apr 15	Introduction to FT-IR microspectroscopy; Dr. Mitra	5(Ch 22); handout
	Apr 20 (lab)	Gemstone Identification	1(Ch 12)
14	Apr 22	Microchemistry	5(Ch 19); 1(Ch4)
	Apr 27 (lab)	Micro Analysis Lab	5(Expt 19)
15	Apr 29	Review for Final	
	May 4	NYPD Lab Tour—Trace Evidence Section	
Final	TBD		