

Biology 4240.001 - Forensic Microscopy Syllabus – ver. 5.1

Fall 2025

Lecture - (In person): Mondays 6 pm to 8:50 pm. Wooten Hall Building, Room 312

Laboratory (Life Science Building, Room 310): (IN PERSON LABS)
Section 1: Friday 1 pm to 3:50pm

Professor: Mr. Richard N. Ernest, Lab Director- Alliance Forensics Laboratory, Inc. business cellphone (817)-228-6526, e-mail: Richard.Ernest@unt.edu – **No office on campus.**

Lab Instructor: Dr. Andrea Bernardino – Office in UNT BIO Building - Room A222

Email: Andrea.Bernardino@unt.edu

Lab TAA: Mia Cook, Email: MickaelaCook@my.unt.edu

Textbook: Fundamentals of Forensic Science, 3rd Edition by Max Houck and Jay Siegel

Lab Workbook: Practical Forensic Microscopy, 2nd Edition by Barbara Wheeler

Websites: <https://micro.magnet.fsu.edu/primer/> <https://en.wikipedia.org/wiki/Microscopy>
<https://www.microscopyu.com/> <https://www.olympus-lifescience.com/en/microscope-resource/>
<https://www.mccrone.com/modern-microscopy/> www.afte.org
<https://afte.org/about-afte/code-of-ethics/>

Lecture Schedule:

8/18- CLASS – Syllabus overview - Introduction: An overview of Forensic Microscopy, Types of Microscopes, Uses of Microscopy in Forensic Science

Reading assignments for class on 8/18

- Read Chapters 1-5 in textbook. Study all websites listed above for background information.
- Read Chapters 1 and 6 in lab manual/workbook in preparation for the first 3 lab sessions.

8/22 - Laboratory - Introduction to the Microscopy Lab and safety procedures

08/25 - CLASS – Organization of the Forensic Laboratory, Microscopy in The Crime Laboratory, Crime Scene Analysis, the Nature of Evidence, Locard's Exchange Principle and Trace Evidence analysis.

08/29 - LAB - Stereomicroscopy: Use of the Stereomicroscope - describing and comparing samples.
Read Chapter 1 in Lab Manual.

9/01- Labor Day - NO CLASSES

9/05 – LAB – Physical Matching (Fracture Matching) - Read Chapter 6 in the Lab Manual

9/08- CLASS - The nature and properties of light, UV light, fluorescence, phosphorescence

- Compound Light Microscopy (CLM)
- Specialized techniques in Microscopy
- Digital Imaging and Photomicrography

9/12 - LAB – Compound Microscopes: How to use and calibrate. Make sample slides. Read Chapter 2 in Lab Manual.

09/15 - CLASS – Trace Evidence Examinations - overview - introduction to Sperm Analysis

The microscopy of human hair, animal hair, natural fibers, man-made fibers

Read Chapters 10, 12 and 15 in Textbook, and Chapter 17 and 28 in the Lab Manual

09/19 - LAB - Hair examinations and Sperm Analysis. Read Chapters 2, 17 and 28 in Lab Manual.
Compound Microscopes: How to use and calibrate. Observing and making sample slides.

9/22- CLASS – Introduction to Polarized Light Microscopy (PLM).
Read Chapter 4 in Textbook, Read Chapter 3 in Lab Manual

09/26 - LAB – Polarization: Introduction and uniaxial observations. Chapter 3 in Lab Manual.

09/29- CLASS – Comparative Soil Analysis, Optical Crystallography, Crystal Morphology and Microcrystalline tests.
Read Chapter 17 in Textbook and Chapter 22 in the Lab Manual.

10/03 - LAB – Soil analysis. Read Chapters 21 and 22 in the Lab Manual

10/06 - MIDTERM TEST - Note: This test is up to 1/3 of your Final Course Grade

10/10 – LAB – To be determined

10/13 - CLASS – Mid-Term Test review and The Microscopy of Botanical and Biological material.

10/17 - LAB – Polarization: conoscopic observations: Iso/Anisotropic minerals. Read lab handouts.

10/20- CLASS – The microscopic analysis of glass and paint (Chapters 16 and 17 in Textbook)

10/24 - LAB – Analysis of glass. Chapter 19 in Lab Manual.

10/27- CLASS – The microscopy of Firearms evidence and Gunshot Residue Analysis (Chapter 21 in Textbook)

10/31 - LAB – Firearms. Chapter 11 in Lab Manual.

11/03- CLASS – The microscopy of Fingerprint and Questioned Document evidence (Chapters 19 and 20 in Textbook)

11/07 - LAB – Fingerprint analysis. Chapter 9 in Lab Manual.

11/10- CLASS – The microscopy of Tool Mark evidence (Chapter 21 in Textbook and Chapter 10 in Lab Manual) and Impression evidence (Chapter 22).

11/14 – LAB - Analysis of Toolmark Evidence – Chapter 10 in the Lab Manual

11/17 – CLASS - Legal Aspects and Ethical Behavior for Forensic Scientists -
(see <https://afte.org/about-afte/code-of-ethics/>) Chapters 24 & 25 in Textbook

11/21 - **Lab Review Project**

11/24 through 11/28 - NO CLASSES or LABS - Happy Thanksgiving!

12/01 - Pre-Final Week – Q & A Period

12/08- FINAL EXAM - Note: This test is up to 1/3 of your Final Course Grade

CLASS POLICIES:

Attendance Policy: Your attendance for the full period is required for every class session and laboratory session. Three (3) unexcused absences will lower your final grade by one letter grade.

Test Makeup & Late Assignment Policy- makeup tests and assignments may be allowed with prior approval from course instructor. See policies below on Excused Absences and Make-ups.

Grade disputes: It is the responsibility of a student to notify the instructor of a grade dispute on a test.

The student has 7 days after a test to notify and resolve a disputed grade with the instructor.

Class grade (66.66%) + Lab grade (33.34%) = Final Course Grade. There are no Extra Credit Projects.

Drop Information – students should refer to UNT Registrar’s Office online for schedule

Academic Dishonesty – Refer to UNT policy below. Academic dishonesty is not tolerated at UNT.

Disability Policy- *“The University of North Texas is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 – The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.”*

Communication Expectations: If you have any questions about the course or assignments, please contact me via email at rnernest@flash.net and I will respond within 24 hours on weekdays if at all possible.

Welcome to UNT

As members of the UNT community, we have all made a commitment to being part of an institution that respects and values the identities of the students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment, and retaliation.

Course Description

Introduction to microscopic analysis with emphasis on the fundamentals necessary for identification and characterization of forensic evidence materials such as glass, hair, fibers, soil, bullets, fingerprints and biological samples.

Course Structure

This lecture class and labs take place in person! Your interaction with me will take place in class. PowerPoints from the class lectures will be posted on Canvas. There are 12 lectures in the course, and there are 2 tests (Midterm and Final). I will open up a new lecture module each week on Canvas. There will be no Extra Credit Projects assigned to students to improve their grades.

Course Prerequisites or Other Restrictions

Students must complete BIOL 3331 and BIOL 3451.

Course Objectives:

Upon successful completion of this course, students will have been introduced to the following:

1. The proper procedures for using a stereomicroscope, compound light microscope, polarized microscope and a firearms and tool marks comparison microscope.
2. Identifying the different parts of all the microscopes listed above.
3. Understanding Köhler Illumination.
4. Preparing different types of mounting techniques.
5. Calculating the magnification and calibration factor on a microscope.
6. Centering a polarized microscope stage.
7. Analyzing fiber and hair samples using microscopic techniques.
8. Differentiating between different types of soil base by macroscopic and microscopic characteristics.
9. Describing the physical characteristics of glass. Learning how to calculate density and determining the refractive indices.
10. Distinguishing the different fingerprints categories.
11. Understanding physical match examinations.
12. Identifying the characteristics of toolmarks produced by a particular tool (firearms, screwdrivers, cutters, etc.) using macroscopic and microscopic techniques and instruments.

Course Technology & Skills:

Minimum Technology Requirements

- Computer
- Reliable internet access
- [Canvas Technical Requirements](https://clear.unt.edu/supported-technologies/canvas/requirements) (<https://clear.unt.edu/supported-technologies/canvas/requirements>)

Technical Assistance

Please contact the UNT Student Help Desk for help with Canvas or other technology issues.

UIT Help Desk: [UIT Student Help Desk site](http://www.unt.edu/helpdesk/index.htm) (<http://www.unt.edu/helpdesk/index.htm>)

Email: helpdesk@unt.edu

Phone: 940-565-2324

In Person: Chemistry Building, Room 253

Walk-In Availability: 8am-9pm

Telephone Availability:

- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm
- Saturday: 9am-5pm

Laptop Checkout: 8am-7pm

For additional support, visit [Canvas Technical Help](https://community.canvaslms.com/docs/DOC-10554-4212710328) (https://community.canvaslms.com/docs/DOC-10554-4212710328)

Rules of Engagement

- While the freedom to express yourself is a fundamental human right, any communication that utilizes cruel and derogatory language on the basis of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law will not be tolerated.
- Treat your instructor and classmates with respect in any communication online or face-to-face, even when their opinion differs from your own.
- Ask for and use the correct name and pronouns for your instructor and classmates.
- Speak from personal experiences. Use “I” statements to share thoughts and feelings. Try not to speak on behalf of groups or other individual’s experiences.
- Use your critical thinking skills to challenge other people’s ideas, instead of attacking individuals.
- Avoid using all caps while communicating digitally. This may be interpreted as “YELLING!”
- Be cautious when using humor or sarcasm in emails or discussion posts as tone can be difficult to interpret digitally.
- Avoid using “text-talk” unless explicitly permitted by your instructor.
- Proofread and fact-check your sources.
- Keep in mind that online posts can be permanent, so think first before you type.

Safety Procedures (for lab only)

The procedures below are for implementation in the BIOL 4240 lab and required in order to allow the laboratory sessions to be conducted based on new requirements by the University of North Texas. All students are required to follow all the safety rules as they are designed to provide a lab environment that is as safe as possible for all people in the lab room. Students may handle/come across examples of evidence such as but not limited to trace evidence, biological samples, ballistics, controlled substances, etc. Students will be instructed on the proper handling and precautions when examining these types of evidence as well as any chemical hazards. Students are to wear appropriate lab attire and corresponding PPE. Students may be asked to sign a safety agreement/acknowledgement in the laboratory."

- Consistent with CDC Guidelines and state policy.
- Wear gloves when working with biological material and discard them before leaving the lab.
- Enter the labs one by one. All personal belongings (backpacks, purses, etc.) must be placed onto the racks near the door. Essential items only will be allowed at the lab benches (writing utensils, lab manual, laptop, and paper).
- Seating and groups will be assigned in the first lab.
- Individual baskets with lab supplies and specimens will be provided per group. All the materials must be placed back into your individual basket before leaving the lab.
- Follow all directions for working in lab rotations, moving around the classroom, and using sink in the lab.

Assignments

- All lectures will be in person. Read the assignments and handouts, take notes, view any video(s), and understand the PowerPoints. You will be responsible for attending and understanding the material.

Grading

Grades in this course are based on the following, using a traditional A (100-90%), B (89-80%), C (79-70%), D (69-60%), F (59-0%) scale,

Grades will not be rounded up to the next highest grade, as there are ample points available for each letter grade.

No assignments will be accepted past the due date.

Students will be evaluated as noted above based on test scores in the lecture, attendance and participation in the lecture as called upon, and lab attendance and scores.

Course Policies:

Attendance Policy: Your attendance for the full period is required for every class session and laboratory session.

Three (3) unexcused absences will lower your final grade by one letter grade.

Test Makeup & Late Assignment Policy- makeup tests and assignments may be allowed with prior approval from course instructor. **There are no scheduled 'make-up' labs.**

Grade disputes: It is the responsibility of a student to notify the instructor of a grade dispute on a test.

The student has 7 days after a test to notify and resolve a disputed grade with the instructor.

Students are expected to attend class meetings regularly and to abide by the attendance policy established for the course. It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

Attendance:

Students are expected to attend all classes regularly and punctually. Excused absences are, but not limited to,

- (1) Illness certified by a physician,
- (2) Serious illness or death in the immediate family
- (3) Absences sanctioned by the University.

In the event of an excused absence, it is the responsibility of the student to provide proper documentation of the absence to the Lecture Professor and/or Lab Instructor within 7 days of the absence. After 7 days no consideration will be made for excusing the absence and students will forfeit all points associated with the day of absence including but not limited to exams, quizzes, and other assignments.

Documentation to support an excused absence should be on an official letterhead with clear dates and contact information of the document issuing agency/person.

There are no scheduled 'make-up' labs. If you miss a class because of an excused absence, it is your responsibility to contact your instructor (email or leave a message) and proceed to any other lab sections available the same week."

Excused Absences:

1. Students are expected to attend all classes regularly and punctually. An absence may be excused for the following reasons:

- a. religious holiday, including travel for that purpose.
- b. active military service, including travel for that purpose.
- c. participation in an official university function.
- d. illness or other extenuating circumstances.
- e. pregnancy and parenting under Title IX; and
- f. when the University is officially closed.

Absence for Religious Holidays: Refer to the UNT Catalog: A student absent due to the observance of a religious holiday may take examinations/complete assignments scheduled for the day(s) missed within a reasonable time after the absence. Class participants must notify the instructor, in writing, of planned absences for religious holidays by the 12th day of the beginning of the class.

Absence for Military Service: In accordance with section 51.9111 of the Texas Education Code, a student is excused from attending classes or engaging in other required activities, including exams, if he or she is called to active military service of a reasonably brief duration. The maximum time for which the student may be excused has been defined by the Texas Higher Education Coordinating Board as "no more than 25 percent of the total number of class meetings or the contact hour equivalent (not including the final examination period) for the specific course or courses in which the student is currently enrolled at the beginning of the period of active military service." The student will be allowed a reasonable

time after the absence to complete assignments and take exams. Policies affecting students who withdraw from the University for Military Service are given in the Withdrawal section.

Participation in University Sponsored Activities: such as athletics, debate, musical organizations, AFROTC, class field trips, etc., must be authorized by the student's academic dean. Within three days after the absence, students must obtain authorized absence cards from the Dean of Students for presentation to their instructors.

Student Absence for Official University Functions: Student absences due to participation in an official university function or activity must be approved in advance by the department chair and the academic dean. Athletic team member absences will be approved by the athletic director or designee. Excused students will be permitted to make up missed work when practicable or will be given special consideration so they are not penalized for their absence. The academic dean/athletic director or designee will notify the Dean of Students office regarding the excused absences and the student will pick up the approved absence card to present to all instructors.

Student Absence Due to Illness or other extenuating circumstances. In case of an illness that will require absence from class for more than one (1) week, the student should notify his or her faculty member.

Pregnancy and Parenting under Title IX. A student who is pregnant or who has given birth must be excused from class for as long as the student's doctor certifies the absences is medically necessary. A faculty member, department, or other academic unit that establishes course-wide attendance standards must comply with this policy.

In the event of an excused absence, it is the responsibility of the student to provide proper documentation of the absence to the Lecture Professor and/or Lab Instructor within 7 days of the absence. After 7 days no consideration will be made for excusing the absence and students will forfeit all points associated with the day of absence including but not limited to exams, quizzes, and other assignments.

Documentation to support an excused absence should be on an official letterhead with clear dates and contact information of the document issuing agency/person. There are no scheduled 'make-up' labs. If you miss a class because of an excused absence, it is your responsibility to contact your instructor (email or leave a message) who will provide a reasonable time to complete an online assignment.

UNT Policies:

Academic Integrity Policy

Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

ADA Policy

UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. For additional information see the [ODA website \(https://disability.unt.edu/\)](https://disability.unt.edu/).

Prohibition of Discrimination, Harassment, and Retaliation (Policy 16.004)

The University of North Texas (UNT) prohibits discrimination and harassment because of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law in its application and admission processes; educational programs and activities; employment policies, procedures, and processes; and university facilities. The University takes active measures to prevent such conduct and investigates and takes remedial action when appropriate.

Acceptable Student Behavior

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in

unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT's [Code of Student Conduct](https://deanofstudents.unt.edu/conduct) (<https://deanofstudents.unt.edu/conduct>) to learn more.

Student Evaluation Administration Dates

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the [SPOT website](http://spot.unt.edu/) (<http://spot.unt.edu/>) or email spot@unt.edu.

Sexual Assault Prevention

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT's Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim's compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565- 2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oco@unt.edu or at (940) 565 2759

Use of Generative Artificial Intelligence (AI)

Definition: "Generative Artificial Intelligence (AI) is a system of algorithms or computer processes that can create novel output in text, images or other media based on user prompts. These systems are created by programmers who train them on large sets of data. The AI learns by finding patterns in the data and can then provide novel outputs to users' queries based on its findings.

Generative AI systems are distinguished from other AI systems by their ability to create novel output. For example, predictive AI systems on smartphones can suggest a short, common response to an email by analyzing the text received and drawing from a pool of common responses. Generative AI systems like ChatGPT, which employs a Large Language Model, go a step further to provide new information for users based on their questions or requests.

Text based generative AI systems are based on large language models, which are huge probabilistic algorithms for drawing upon a corpus of text to predict likely sequences of words. Other generative AI systems may be based on images or sounds as well." <https://www.nnlm.gov/guides/data-thesaurus/generative-artificial-intelligence>

Limited Use is permitted in this course (Lecture and Laboratory).

- Specifically, you may use GenAI to assist in general information about course related topics, help finding legitimate scientific resources, and tools such as Grammarly to improve the clarity of your writing.
- Any use must be cited – which GenAI is used and for what purpose.