

BIOL 4590: Forensic Molecular Biology Laboratory

Fall 2019 Syllabus

Course Instructor: Kristi Dutton, MS, MB (ASCP)^{CM} (kristi.dutton@unt.edu)
Lecture University of North Texas, Biology Department
Office hours: by appointment only

Lab TA: Katherine Smart (KatherineRSmart@gmail.com)
University of North Texas, Chemistry Department
Office hours: by appointment only

<u>Lecture:</u>	Friday 6:00 – 7:50pm	<u>Room</u>
<u>Lab:</u>	Tuesday/Thursday 4:00 - 6:50 pm	Life Science A218 Life Science A217

Textbook: Fundamentals of Forensic DNA Typing
Author: John Butler, Academic Press, 1st Edition, 2010
ISBN 978-0-12-374999-4

Course Credits: 3

Prerequisite/Concurrent Registration: BIOL/BIOC 4570 or its equivalent

Attendance Policy: Attendance is mandatory for all lectures, laboratory exercises, and exams. Students with unexcused absences will **not** receive credit for missed sessions. Students with excused absences are responsible for all missed lecture and laboratory material.

Grading: Final grades will be determined in the following manner:

Laboratory results and Case File: 20%
Oral presentation: 5%
Quizzes: 15%
Written Exams: 60% (3 exams @ 20% each)

Each student is required to maintain a bound laboratory notebook with perforated pages that may be neatly removed. The student is expected to record the purpose and general description of each experiment, maintain a detailed log of each experiment, and record its result. Each student will also maintain a designated **case file** folder. This folder is representative of a **case file** found in a real-world Forensic Biology laboratory. All completed documentation pertaining to the mock case (laboratory protocols, chain of custody, case file worksheets, etc.) will be maintained in the **case file**. Students are required to completely document procedures during labs and after labs as necessary. Periodically during the semester, the student will hand in his/her lab notebook **and** case file for review and grading. Missing information will result in deduction of points **each** time the lab notebook/case file is found to be incomplete.

Course Objectives: This is an intensive laboratory course designed to give students experience and expertise in the basic molecular techniques currently utilized by many forensic laboratories performing forensic DNA analysis. These methods include a variety of DNA extraction techniques from different sources, DNA quantification, PCR amplification of selected polymorphic nuclear/autosomal loci, and fragment analysis utilizing capillary electrophoresis. Laboratory exercises will be carried out in a “mock case” format where possible. The laboratory portion will not only give the students hands-on experience with a variety of forensic techniques, but will also train the student in proper record-keeping, laboratory QA/QC, and performing routine laboratory calculations. Integrated lectures will provide the student with a deeper understanding of the scientific foundation for and development of each method. This is expected to allow students to later train individuals themselves as methods evolve, independently monitor and trouble-shoot theirs or another person’s work, and to effectively explain methods/results to criminal investigators, attorneys, and juries.

Exam Policy: All exams will be in written format and may include a combination of free response questions, short-answer questions, matching, fill-in the blank, or multiple-choice questions.

Laboratory Requirements: The student is expected to provide his/her own laboratory coat (disposable are acceptable), laboratory notebook and a laboratory binder/folder representative of a Forensic Biology case file. Latex gloves & safety goggles will be provided. Please inform the instructor in advance of any allergies or any other health issues that might affect or impair his/her ability to participate fully in this course.

Laboratory Safety: During this laboratory course, the student will be handling and processing human biological material. The student may be expected to provide his/her own biological material (blood, saliva and hair) for some exercises. Other biological materials (blood, saliva, seminal fluid) will be provided from individuals who have been screened for blood-borne pathogens. The student will receive instruction in the proper handling and precautions used when examining this type of evidence. Students will also be instructed in the proper handling of any chemical hazards they might encounter during this course. **In case of an accident or spill notify the instructor immediately. A first aid kit is located in the laboratory.**

Pregnancy: A student who is pregnant, suspects that she is pregnant, or becomes pregnant during the course should consult the *Student Handbook* heading “*Participation in Special Environments*” for information. The Course Director will be available to assist you.

Academic Dishonesty: 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.

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. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at disability.unt.edu.

Detailed List of Covered Laboratory Protocols:

Good Laboratory Practices
QA/QC Procedures
Evidence Handling and Chain of Custody
Presumptive & Confirmatory Tests for Biological Materials/Fluids
Organic Extraction on Bloodstains and Whole Blood
Chelex Extraction and Solid Phase Extraction
Differential Extraction of Semen-Containing Samples (sexual assault mixtures)
FTA Extraction (blood and buccal)
Quantifiler® DNA Quantification (Real-Time PCR, qPCR)
PCR Amplification of Autosomal and Y-Specific STR Loci
Genotyping via Capillary Electrophoresis (ABI 3130xl)
Genetic Data Analysis and Interpretation
mtDNA Amplification and DNA Sequence Analysis
Forensic DNA Case File Preparation and Report

Approximate Lecture/Laboratory Schedule

<u>Date</u>	<u>Topic</u>
Week 1	Course Introduction, Record Keeping, Safety, Understanding the Human Genome
Week 2	Historical Methods, Pipetting
Week 3	Evidence Screening/documentation, Pipetting
Week 4	Evidence Screening/documentation, Innocence Project
Week 5	Presumptive and Confirmatory Tests (Semen)
Week 6	Exam 1; Presumptive and Confirmatory Tests (Blood)
Week 7	DNA Damage and Degradation
Week 8	DNA Extraction Methods
Week 9	DNA Extraction Methods
Week 10	DNA Quantification (qPCR: human-DNA-specific)
Week 11	Exam 2; PCR amplification of STR loci
Week 12	PCR and STR Genotyping
Week 13	Oral Presentations; Genetic Data Analysis; Data Interpretation
Week 14	Ethics/lab clean-up; Thanksgiving
Week 15	Ethics; Final Exam
Week 16	Finals Week

This syllabus is tentative and subject to change with advanced notice from your instructor. Note – exact dates for quizzes and exams can be changed prior to the event. Dates above are estimates of the week these activities will fall on.