FORS 6361
Advanced Forensic DNA
Fall Semester 2017

Professor: Bobby L LaRue, PhD Office: CFS Bldg. / 222
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Class hours: Monday 1200-1350 Classroom: CFS 101
Lab Hours: Monday 1400-1750 Classroom: CFS 219
Office Hours: Mon and Wed 0800-1000 (other times by e-mail appointment)

Required textbooks

a) Advanced Topics in Forensic DNA Typing: Methodology by John Butler. Academic Press. 2012.
b) Advanced Topics in Forensic DNA Typing: Interpretation by John Butler. Academic Press. 2014. ISBN-13: 978-0124052130. ISBN-10: 0124052134

Suggested textbooks

c) DNA Typing Protocols: Molecular Biology and Forensic Analysis by Bruce Budowle (Editor). Eaton Publishing Company/Biotechniques Books. 2001
d) Microbial Forensics. Roger Breeze, Bruce Budowle, and Steven Schutzer. Elsevier Academic Press. (2005)

Course description

This course will cover the application of alternative methodologies for human identification and the practical DNA analysis of degraded biological evidence including hair shafts and bones. Different marker strategies for kinship, degraded samples and phenotype-prediction analysis includingMixture interpretation, Insertion-deletion (Indels), Phenotype Informative SNPs (PISNPs), mitochondrial DNA (mtDNA) sequencing and alternative DNA extraction methods will be discussed as well as interpretation of results, biostatistics and standard operation procedures. These techniques will be used as complementary tools of nuclear DNA (nuDNA) analysis. An advanced knowledge of the scientific literature and the ability to integrate molecular biology into practical applications and research is required. During the course students will develop independent learning skills and improve their ability to present complex scientific information orally.

Objectives

1. Practical experience on INDEL genotyping, mtDNA sequencing, and SNP analyses, comparison and interpretation of results.
2. Understand principles of statistical genetics that apply to haploid markers like mtDNA, sexual markers like X-STRs and prediction analysis with PISNPs.
3. Master the use of software necessary to analyze mtDNA and PISNPs, interpretation of results, and statistical conclusions.
4. Master the criteria used to decide which extraction technique should be used depending on the type of minimal biological evidence.
5. Interpret profile results obtained from extremely degraded biological samples and mixtures.

Attendance policy

Attendance will be recorded in keeping with University policy. Students are expected to attend class. Class attendance requirements will be followed in accordance with Academic Policy Statement 800401. In accordance with university policy, students will not be penalized for absences of up to three hours as long as examinations and other assigned work have not been missed. If a student is absent it is their responsibility to obtain the class material and remain current with information distributed during class. Occasionally changes in schedule may be announced in class. *These changes apply to all students, even those who were absent from class.* One letter grade may, at the discretion of the instructor, be deducted from students' final grade if they miss more than four classes. There will be no distinctions between "excused" and "unexcused" absences. Students are expected to be on time to class. After the beginning of the class, late students may be counted as absent.

Grading Policy

Final grades will be based upon the following scale: 90 plus average an "A"; 80 to 89 a "B"; 70 to 79 a "C"; and below 70 an "F". Students should not count on a curve of the final grade. The instructor reserves the right to modify the grading scheme to accommodate for a missed test or final examination in extenuating circumstances.

The instructor reserves the right to assign a final exam grade of 0% should he deem the absence was not properly handled or was unjustified. Appeals will be handled in accord with University Policy Statement 900823, Academic Grievance Procedures for Students.

Make-up Exams

If a student is absent from the laboratory he/she may not be given an opportunity to make up the laboratory exercise, even if prior notice has been

given to the instructor. No make-ups will be given for the final or midterm exams unless arrangements have been made prior to the exam date. It is the student's responsibility to monitor the accuracy of the grades.

Annotated outline of topics to be covered for each class meeting (12 weeks)

Week 1. August 28th.
Mixture Interpretation

Week 2. September 18th.
Mixture Interpretation
Lab P1: (Stand alone practical) Mixture interpretation and LR lab exercises

Week 3. September 25th.
Single Nucleotide Polymorphisms (SNPs)
Lab 1: Bone and hair pre-treatment.

October 2nd . International Symposium on Human Identification
No classes, but INDEL readings will be assigned

Week 4. October 9th
Single Nucleotide Polymorphisms (SNPs) Applications
Lab 2: Bone, hairs: Freezer-mill treatment. Bone DNA extraction.

Week 5. October 16th
DNA sequencing and Mitochondrial DNA analysis I
Lab 3: nuDNA (LINE-1) and mtDNA quantification

Week 6. October 23rd
Exam 1
DNA sequencing and Mitochondrial DNA analysis II
Lab 4: InDels I (INDEL/INNUL amplification; INNUL spectral calibration)

Week 7. October 30th
Micro-RNAs markers: Forensic Body Fluid ID
Lab 5: InDels II (Capillary electrophoresis and custom bin/panel design)

Week 8. November 6th
Missing Persons and Disaster Victim Identification
Lab 7: PCR HV1 and HV2 mtDNA regions

Week 9. November 13th

Non-human DNA Testing
Lab 8: SNaPShot of mtDNA SNPs

Week 10. November 20th.
Microbial Forensics
Lab 9: Sanger Sequencing

November 27th. Thanksgiving
Lab 10: Mitochondrial DNA analysis

Week 11. November 30th.
Exam 2

Week 12. December 4th.
Final examination at normal class time on Monday.

Examinations and Assignments

There will be two mid-term exams and one written final examination, in accordance with university policy. The final examination is *comprehensive* and may be based upon any information from anytime during the course. The written final examination will be composed of multiple choice questions, true-false questions, fill in the blank questions, and/or short answer questions. The final examination and tests may be composed of any combination of the aforementioned question types or may be composed of only two or three of the question types. Students will be required to apply their acquired knowledge to process degraded evidence and analyze it using techniques that are widely accepted by the scientific community.

Assignments will consist of lab reports, and one oral presentation.

Lab reports will summarize data and address pertinent questions. Successful completion of lab reports will require the student to apply advanced knowledge acquired in class of forensic lab techniques. Assignments are due at the beginning of class on the due date. The instructor reserves the right to refuse late work, but will make reasonable accommodations for students who experience unfortunate circumstances.

Students will give an oral presentation on an *assigned Forensic DNA topic*. This presentation must be fully referenced and cite published studies in the peer reviewed scientific literature.
The total combined weight of the lab reports will be 20% of the final grade. The oral presentation will comprise 10%. The exams (2) will account for the 40% of

the final grade and the remaining 30% will be based on the performance in the final examination.

	Number	Scope	Timeframe	Weight of Grade
Lab Reports and exercises	Variable	Non-comprehensive	Throughout term	20%
Oral presentation	1	Defined	Variable	10%
Exams	2	Defined	Variable	40%
Final Examination	1	Comprehensive	End of term	30%

Material for the final exam and tests may come from class material, supplemental reading material or class discussion that was not covered in the reading material. *In other words, attendance and active participation in class is extremely important in order to complete the course successfully and receive a good grade.*

Deadlines for assignments, lab reports and other important announcements such as test times and locations will be announced either in class or by email. As a result, students *must* read their SHSU email in order to remain current. Late papers and make-up exams will not be accepted without prior approval obtained from the instructor based on extenuating circumstances

Academic dishonesty
http://www.shsu.edu/dotAsset/728eec25-f780-4dcf-932c-03d68cade002.pdf

Disabled student policy
http://www.shsu.edu/dotAsset/7ff819c3-39f3-491d-b688-db5a330ced92.pdf

Services for disabled students
http://www.shsu.edu/dept/disability/

Student absences on religious holy day policy
http://www.shsu.edu/dotAsset/0953c7d0-7c04-4b29-a3fc-3bf0738e87d8.pdf

Use of telephones and text messagers in academic classrooms and facilities
http://www.shsu.edu/dotAsset/6d35c9c9-e3e9-4695-a1a1-11951b88bc63.pdf

purposes other than personal use by students registered for this course in the current semester.
