

Justice Studies Department
San Jose State University
Fall 2006
Class hours MW 1330-1445
Room: MH 520

Instructor: Dr. Steven Lee
Office Hrs: MW 1445-1645
set by appointment via email
email: Steven.Lee@sjsu.edu

JS 115 DNA and Crime

Course Description:

This course is designed to introduce students to the basics of DNA and the application of DNA to solving crime. Students will be introduced to DNA testing utilized in criminal casework and convicted offender DNA databases. Students will become familiar with the scientific concepts, methods, practices and analytical instrumentation utilized for DNA analysis. Legal issues including national standards for quality assurance, validation, legal admissibility and training will also be covered.

Course Text and materials:

Required Texts:

Forensic DNA Typing: Biology and Technology Behind STR Markers John Butler PhD. 2005. ISBN: 0-12-147952-8, 688pp. Academic Press

Forensic DNA Analysis. Rudin, N. and K. Inman. 2nd Edition. 2001. ISBN: 0849302331 Publisher: CRC Press; 2nd edition (December 21, 2001) 312 pp.

Genetic Testimony. A guide to forensic DNA profiling. Spencer, C. 2004. ISBN 0-13-142338-X. Pearson Education Inc. Upper Saddle River, NJ 07458. 37 pp.

Required reading and Internet materials:

Journal articles and other readings will be accessible at the SJSU library, on reserve or will be accessible on line. Citations and URLs for on line materials will be provided in assignments. These will include:

NIST STRBase: <http://www.cstl.nist.gov/div831/strbase/index.htm>

NCJRS publications - <http://www.ncjrs.org/forensic/publications.html>

http://www.ojp.usdoj.gov/nij/sciencetech/dna_pub.htm : Human Genome Project Links-

http://www.ornl.gov/sci/techresources/Human_Genome/elsi/forensics.shtml: and others

http://www.forensic.to/links/pages/Forensic_Sciences/Field_of_expertise/DNA/ :

<http://www.mass.gov/cpcs/links/>, and ***Genetic Witness: Forensic Uses of DNA Testing***, Office of Technology Assessment; <http://www.wws.princeton.edu/~ota/disk2/1990/9021/9021.PDF>

Supplementary Texts (Optional)- Course material may include citations from the following:

Criminalistics: An Introduction to Forensic Science (College Version), 9/E, Copyright 2007, ISBN-0132216558, RE. Saferstein, Ph.D, Prentice Hall, 672pp.

<http://vig.prenhall.com/catalog/academic/product/0,1144,0132216558,00.html>

Techniques of Crime Scene Investigation, Seventh Edition. 2004 Barry Fisher. ISBN084931691X, 544 pages. CRC Press

The Evaluation of Forensic DNA Evidence Committee on DNA Forensic Science: An Update, National Research Council 272 pages, 6 x 9, 1996, ISBN 0-309-05395-1National Academies Press-Available on-line for free- <http://books.nap.edu/catalog/5141.html>

Course Format:

The course will include lectures by the instructor and guest lectures including scientists from crime laboratories. Discussions, videos, and small-group hands-on activities, will also be included throughout the semester. If possible, on-line chats and field trips (to at least one DNA laboratory) will be scheduled (TBA).

Course requirements:

Exams: Three exams will be given in this course. Exams will be cumulative and will include all material covered up to the date of the exam. Exams may include multiple choice, matching, true/false, short answer, diagrams, drawings and sketches, short essay and/or long essay.

The final will be comprehensive.

Exam 1: 09/27/06 Exam 2: Mon. 11/01/06 Final: TBA

Quizzes and Small Group Activities

Quizzes on assigned readings, small group activities and other assigned materials will be given during the semester. These will generally be multiple choice, matching, true/false and short answer but may also include essay questions.

Grading

Quizzes/Activities	100 points
Exam 1	100 points
Exam 2	100 points
Final exam	200 points
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Total required	500 points

Extra Credit A total of 10 points may be granted for additional extra credit small group assignments and other assignments during the semester. Each assignment will be worth 1-2 points each. These extra credit points may be used to augment your final point total.

Grading Policies

Make-up exams will not generally be permitted. However, under extraordinary circumstances, with proper documentation and approval by the instructor, a 15 page single-spaced term paper of an instructor assigned topic, may substitute for 1 exam.

	From	To
A+	483.5	500
A	467	483.4
A-	450	466.9
B+	433.5	449.9
B	417	433.4
B-	400	416.9

C+	383.5	399.9
C	367	383.4
C-	350	366.9
D+	333.5	349.9
D+	317	333.4
D-	300	316.9
F	<300	

Instructor

Professor Lee holds an MS from NYU and PhD from University of California, Berkeley in Molecular Biology. Lee holds several concurrent positions including a consulting position as Director of R&D at MiraiBio Inc. a small biotech company in Alameda, CA, Visiting Scholar at UC Berkeley, and holds adjunct professor appointments in Biological Sciences at San Francisco State University and Chemistry at Florida International University. He was formerly the Director of R&D at CA Dept of Justice DNA Laboratory from 1994-2000 where he served as an expert witness in DNA and conducted DNA training courses. He is a full member of the American Association for the Advancement of Science, American Academy of Forensic Sciences, the California Association of Criminalists, and is an American Society of Crime Laboratory Directors Laboratory Accreditation Board certified inspector. He also served on the FBI Technical Working Group on DNA Analysis Methods group from 1994-2000. He has taught courses in molecular biology at SFSU (1996-1998), Forensic genetics at UC Davis (1997), and most recently forensic DNA Typing of STRs at FIU (2003).

Academic Integrity

Academic integrity statement (from the Office of Student Conduct and Ethical Development):

“Your own commitment to learning, as evidenced by your enrollment at San José State University, and the University’s Academic Integrity Policy requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the Office of Student Conduct and Ethical Development. The policy on academic integrity can be found at http://sa.sjsu.edu/student_conduct.”

Additional information on Academic Integrity

Academic integrity is essential to the mission of San José State University. As such, students are expected to perform their own work (except when collaboration is expressly permitted by the course instructor) without the use of any outside resources. Students are not permitted to use old tests, quizzes when preparing for exams, nor may they consult with students who have already taken the exam. When practiced, academic integrity ensures that all students are fairly graded. Violations to the Academic Integrity Policy undermine the educational process and will not be tolerated. It also demonstrates a lack of respect for oneself, fellow students and the course instructor and can ruin the university’s reputation and the value of the degrees it offers. We all share the obligation to maintain an environment which practices academic integrity. ***Violators of the Academic Integrity Policy will be subject to failing this course and being reported to the Office of Student Conduct & Ethical Development for disciplinary action which could result in suspension or expulsion from San José State University.*** The policy on academic integrity can be found at: http://sa.sjsu.edu/student_conduct.

CHEATING:

At SJSU, cheating is the act of obtaining or attempting to obtain credit for academic work through the use of any dishonest, deceptive, or fraudulent means. Cheating at SJSU includes but is not limited to: Copying in part or in whole, from another’s test or other evaluation instrument; Submitting work previously graded in another course unless this has been approved by the course instructor or by departmental policy. Submitting work simultaneously presented in two courses, unless this has been approved by both course instructors or by departmental policy. Altering or interfering with grading or grading instructions; Sitting for an examination by a surrogate, or as a surrogate; any other act committed by a student in the course of his or her academic work which defrauds or misrepresents, including aiding or abetting in any of the actions defined above.

PLAGIARISM:

At SJSU plagiarism is the act of representing the work of another as one’s own (without giving appropriate credit) regardless of how that work was obtained, and submitting it to fulfill academic requirements. See Office of Student Conduct and Ethical Development at http://sa.sjsu.edu/student_conduct.

Plagiarism at SJSU includes but is not limited to: The act of incorporating the ideas, words, sentences, paragraphs, or parts thereof, or the specific substances of another’s work, without giving appropriate credit, and representing the product as one’s own work; and representing another’s artistic/scholarly works such as musical compositions, computer programs, photographs, painting, drawing, sculptures, or similar works as one’s own. All students are required to take the on-line tutorial and quiz on plagiarism: Go to: <http://tutorials.sjlibrary.org/plagiarism/index.htm> Take the quiz and print out your results You must complete this tutorial and print out your report at the end to hand in to the instructor.

Campus policy in compliance with the Americans with Disabilities Act:

“If you need course adaptations or accommodations because of a disability, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with DRC to establish a record of their disability.”

Tentative Course Schedule:

Dates	Topics	Butler/*Inman
Week 1:	Introduction and Overview of DNA and Crime	C1/ C3&C5
08/23	Handouts-Syllabus- Reading material Introductions: Your background, my background Course Description, requirements, grading etc. Set up small student groups Overview of Forensic DNA typing and History of Forensic DNA <u>Assignment 1- Required reading:</u> Spencer, C. 2004. Genetic Testimony: Introduction and Questions About DNA Profiling Methods. Lee, SB. 2006. Forensic DNA Typing. McGraw-Hill Yearbook of Science and Technology. McGraw-Hill In press. To be distributed. Optional reading: Weedn, VW- Unrealized potential of DNA testing - http://www.ncjrs.org/pdffiles/170596.pdf Visit the following site- Introduction to DNA http://www.deakin.edu.au/forensic/Chemical%20Detective/DNA_Type.htm	
Week 2:	Basics of Physical Evidence	NA / C1-C2
08/30	Introduction to Physical Evidence Common Types of Physical Evidence. - The Significance of Physical Evidence. Locard's Exchange Principle- Class vs Individual Characteristics Biological Physical Evidence Optional CSI web links: http://www.deakin.edu.au/forensic/Chemical%20Detective/Crime_scene.htm http://www.crime-scene-investigator.net/ http://www.profiling.org/journal/vol1_no1/jbp_ed_january2000_1-1.html <u>Assignment: Required Reading:</u> Collection and Preservation of Physical Evidence- Chain of Custody or <i>The Real CSI</i> Special collection guidelines for Biological Evidence Spear, T. http://www.cacnews.org/wordfiles/DNA%20SampleHandling.doc Spencer, C. 2004. Genetic Testimony. Questions About the Use of Forensic DNA Profiling. What Sort of Crime Evidence Is Suitable for DNA Analysis? What Are the Uses of Forensic DNA Profiling? What Are the Advantages of DNA Evidence Over Other Types of Biological Forensic Evidence? How Reliable is DNA Profile Technology? What Are the Main Problems with Forensic DNA Profiling? <i>Additional Optional Readings</i> Kobilinsky, L. 1992. Recovery and Stability of DNA in Samples of Forensic Science Significance. Forensic Sci. Rev. 4. 67. Gialamas, D and Stockwell, D. 1995. Forensic Biology Sample Collection and Handling Techniques. A Look at Methods Utilized by California Crime Labs CAC News Summer 1995.	
Week 3	Collection and Preservation of Physical Evidence	
09/06	Video- Forensic DNA with in class assignment Lee on Jury Duty in Contra Costa <u>Assignments- Required Reading:</u> Visit www.dna.gov - http://www.dna.gov/basics/evidence_collection Read all sub pages (all blue sub links in each of the sections): Crime Scene Integrity, Chain of Custody, Contamination of Evidence, Evidence Transportation and Storage, Sources and Locations of DNA Evidence.- Study for quiz on this material	

Week 4	DNA Biology- The Scientific Basis for DNA typing	C2/ C4
09/13	Introduction to DNA and Basic Human Genetics Scientific Basis for DNA typing - <u><i>Why DNA?</i></u> Intro to Deoxyribonucleic Acid: Central Dogma- DNA extraction Genetic Code , DNA Structure, Function and Replication Cell Biology, Chromosomes, Genes and DNA markers Basic Human Genetics- <u>A tribute to Mom and Dad</u> Inheritance of DNA – Mendelian Genetics DNA variation and DNA Methods Web links for DNA biology http://www.gened.com/demo/index.html - Go to Methods in Molecular biology- Go to the fundamentals- section 6- DNA/RNA structure http://www.blc.arizona.edu/Molecular_Graphics/DNA_Structure/DNA_Tutorial.HTML	
Week 5:	Methods used in Forensic DNA	
09/20	Sampling/Evaluation of Biological Evidence and DNA extraction C3/ C5&C6 Screening samples- Serology, Microscopy, Fluorescence or <u>Where is the DNA?</u> Types and amount of samples required for DNA typing References- www.fbi.gov/programs/lab/fsc/backissu/july1999/ponce.htm Cox, M. 1991. A Study of the Sensitivity and Specificity of Four Presumptive Tests for Blood. Journal of Forensic Science 36(5) 1503-1511 DNA Extraction and Quantification or <u>How do they get DNA?</u> Overview of Typing- Methods used to isolate DNA and Quantify DNA <u><i>How much DNA do they need?</i></u> DNA from a Cougar- <i>Whos' DNA is it? Human or Non-human?</i>	
	Review for Exam 1: Student led reviews	Butler C1-C4/ Inman C1-C6
Week 6:	Exam 1	
09/27	Exam 1 covering Butler C1-C4/ Inman C1-C6, URLs and journal articles that have been assigned, videos and any guest lecturers	
Week 7:	Methods continued- Assessing DNA variation	C1&4/ C6
10/04	Evaluating DNA variation or <u>Does size matter?</u> Introduction to RFLP - Electrophoresis in a Classroom Introduction to Polymerase Chain Reaction – <u>Who wants to be a DNA billionaire?</u> http://www.pcrlinks.com/generalities/introduction.htm http://www.accessexcellence.org/RC/VL/GG/polymerase.html	
Week 8:	Topic PCR: Video or other activity	
10/11	Lee at Promega International Symposium on Human ID Class activity to be announced	
Week 9	Introduction to STRs and Forensic Issues	C5-6/ C6-C7
10/18	Biology of STRs Commonly used autosomal STRs Biology of STRs Repeat Slippage, Mutation rates, Chromosomal Abnormalities and consequences on Forensic STR results	

Reading- Moxon et al 1999. Sci Amer. 280: 94 to be distributed

Web Link- www.cstl.nist.gov/biotech/strbase

Budowle et al. 2001. JFS 46:453-489 (CODIS STR Pop)

Additional Optional Readings

Walsh et al. 1996 NAR. 24:2807-2812, Levinson et al. 1987. Mol Biol Evol. 4:203-221, Brinkmann. 1998 Am J Hum Genet 62:1408, Henke et al. Am J Hum Genet 64:1473.

Week 10: Data collection (instrumentation) and Interpretation C12-14/C6-C8

10/25 DNA separation methods- Gels vs Capillaries
STR detection methods - Introduction to Fluorescence
Web link- <http://www.probes.com/servlets/publications?id=144>

Student Led Exam 2 Review Butler C5-6, 12-14/Inman C6-8

Week 11 Exam 2

11/01 Exam 2 Covering Butler C5-6, 12-14/Inman C6-8 URLs and journal articles that have been assigned, videos and any guest lecturers

Week 12 Understanding STR results, Forensic Issues& DNA Databases C18-19& C7/ C4&C8

11/8 **Population Stats - Genetics- Hardy-Weinberg Equilibrium**
Degraded DNA, PCR inhibition, contamination, Mixed samples and Interpretation
SWGAM STR Interpretation Guidelines
<http://www.fbi.gov/hq/lab/fsc/backissu/july2000/strig.htm>
Combined DNA Index System- Value of DNA databases
Levels of CODIS, Privacy Issues, QC, Searching, sample collection
Database Laws- Int'l DNA databases <http://www.fbi.gov/hq/lab/codis/index1.htm>
Assignments- Required Readings:
Spencer C. 2004. Genetic Testimony: Questions About Interpreting DNA Profiles. Why are DNA Profiles Interpreted in Terms of Probabilities? How Are DNA Profile Probabilities Calculated and Presented? Is a Person's DNA Profile Unique? If a Defendant's Profile Matches That of the Crime Scene Sample, Does That Prove the Defendant's Guilt?

Week 12: Cold Hits, Unsolved crimes, other markers C8-10/ C9

11/15 **DNA databases- Unsolved crimes -CHOP**
Forensic DNA database issues- Familial Searching, Privacy and Ethical Issues
Gender typing, Amelogenin and Y STRs or Is it a boy or a girl? C8-11
The "new" genetic markers- mtDNA and SNPs
Y Chromosome Markers
Assignments- Required Reading: Spencer, C. Genetic Testimony: Questions About the Use, Collection, and Storage of DNA Profiles. How Many Profiles Are in the CODIS Databanks? Whose DNA Profile Should Be Included in DNA Databases? After Profiling and Electronic Storage of the Profile, Should the Tissue Sample Be Retained or Destroyed? Can Personal or Medical Information Be Obtained from DNA Profiles?

Week 13 No Class- Thanksgiving

11/22 No class

Week 14 Quality Control, Validation and Training Standards Journal articles TBA

11/29 Scientific and Technical Working Groups on DNA Analysis Methods
DNA Advisory Board (DAB), Validation and Accreditation
Optional Reading

Holt et al. 2002. JFS 47:15 TWGDAM Validation
Educational standards for Forensic DNA analysts
Admissibility Standards and Testimony Inman C11
Frye, Daubert and Federal Rules of Evidence
http://www.forensic-evidence.com/site/EVID/EL00003_4.html
STR admissibility link- http://www.denverda.org/html_website/index.html

Week 15	Legal/Ethical Considerations of DNA typing and Future	See URLs
12/06	<p>DNA and legal privacy issues http://www.dnfiles.org/resources/res07.html#cat5 Ethics of Genetic Testing- http://www.nhgri.nih.gov/12010621 How DNA Technology Is Reshaping Judicial Process and Outcome http://www.csis.org/tech/Biotech/nbpp/Seminar2Brief.htm http://www.bc.edu/bc_org/avp/law/lwsch/journals/bciclr/24_2/05_FMS.htm Innocence Project- Uses of DNA in exonerating the innocent Exonerating the wrongfully convicted through post conviction DNA testing http://www.innocenceproject.org/ Convicted by Juries, Exonerated by Science- Case studies http://www.ncjrs.org/pdffiles/dnaevid.pdf Future of DNA typing Future of DNA testing- MicroCE, SNPs, DNA arrays- Bead based methods, hand held??? http://www.ojp.usdoj.gov/nij/pdf/dna_studyreport_final.pdf Assignments: Required Reading: Spencer, C. 2004. Genetic Testimony; Questions About DNA Profiling and the Criminal Justice System. How Can DNA Evidence Exonerate Those Who Are Wrongly Convicted? Why Are Innocent People Convicted of Violent Crimes and Then Exonerated? Is It Possible for an Innocent Person to Be Convicted Based on DNA Evidence? How Is DNA Evidence Changing the American Criminal Justice System?</p>	
	Course Review for final exam Student Led Final Review- Final Exam: TBA	