

Justice Studies Department
San Jose State University
Fall 2004
Class hours MW 1330-1445
Room: MH 520

Instructor: Dr. Steven Lee
Office Hrs: M 1500-1800 T1100-1300
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. 2001. ISBN: 0-12-147951-X Academic Press 322 pp.

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: **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/cpes/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), 8/E, Copyright 2004, published 6-18-2003, RE. Saferstein, Ph.D., ISBN: 0-13-111852-8, Prentice Hall, 608 pp.
<http://vig.prenhall.com/catalog/academic/product/0,4096,0131118528,00.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 0-309-05395-1 National 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: Mon. 10/04/04 Exam 2: Mon. 11/08/04 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
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).

Tentative Course Schedule:

Dates	Topics	Butler/*Inman
Week 1:	Introduction and Overview of DNA and Crime	C1/ C3&C5
08/25	<p>Handouts-Syllabus- Reading material</p> <p>Introductions: Your background, my background</p> <p>Course Description, requirements, grading etc. Set up small student groups</p> <p>Overview of Forensic DNA typing and History of Forensic DNA</p> <p><i>Assignment 1- Visit the following site- Introduction to DNA</i></p> <p>http://www.deakin.edu.au/forensic/Chemical%20Detective/DNA_Type.htm</p> <p><i>Optional reading: Weedn, VW- Unrealized potential of DNA testing -</i></p> <p>http://www.ncjrs.org/pdffiles/170596.pdf</p>	
Week 2:	Basics of Physical Evidence	NA / C1-C2
08/30	<p>Introduction to Physical Evidence</p> <p>Common Types of Physical Evidence. - The Significance of Physical Evidence.</p> <p>Locards Exchange Principle- Class vs Individual Characteristics</p> <p>Biological Physical Evidence</p> <p>Optional CSI web links:</p> <p>http://www.deakin.edu.au/forensic/Chemical%20Detective/Crime_scene.htm</p> <p>http://www.crime-scene-investigator.net/</p> <p>http://www.profiling.org/journal/vol1_no1/jbp_ed_january2000_1-1.html</p> <p>Optional Laboratory Tour- Santa Clara County Crime Laboratory.</p> <p>Santa Clara County DA Crime Lab 1557 Berger Drive #B-2 San Jose</p>	
09/01	<p>Collection and Preservation of Physical Evidence- Chain of Custody or <i><u>The Real CSI</u></i></p> <p>Special collection guidelines for Biological Evidence</p> <p>http://www.cacnews.org/wordfiles/DNA%20SampleHandling.doc</p> <p>Additional Optional Readings</p> <p>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 Californai Crime Labs CAC News Summer 1995.</p>	
Week 3	DNA Biology- The Scientific Basis for DNA typing	C2/ C4
09/06	No Class- Holiday	
09/08	<p>Introduction to DNA and Basic Human Genetics</p> <p>Scientific Basis for DNA typing - <i><u>Why DNA?</u></i></p> <p>Intro to Deoxyribonucleic Acid: Central Dogma- DNA extraction</p> <p>Genetic Code, DNA Structure, Function and Replication</p> <p>Cell Biology, Chromosomes, Genes and DNA markers</p> <p>Basic Human Genetics- <i><u>A tribute to Mom and Dad</u></i></p> <p>Inheritance of DNA – Mendelian Genetics DNA variation and DNA Methods</p> <p>Web links for DNA biology</p> <p>http://www.geneed.com/demo/index.html - Go to Methods in Molecular biology- Go to the fundamentals- section 6- DNA/RNA structure</p> <p>http://www.blc.arizona.edu/Molecular_Graphics/DNA_Structure/DNA_Tutorial.HTML</p>	

Week 3:	Methods used in Forensic DNA	
	<u>Sampling/Evaluation of Biological Evidence and DNA extraction</u>	C3/ C5&C6
09/13	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	
09/15	DNA Extraction and Quantification or <u>How do they get DNA?</u> Overview of Typing- Methods used to isolate DNA and Quantify DNA <u>How much DNA do they need?</u> DNA from a Cougar- <i>Whos' DNA is it? Human or Non-human?</i>	
Week 5:	Methods continued- Assessing DNA variation	C1/ C6
09/20	Evaluating DNA variation or <u>Does size matter?</u> Introduction to RFLP - Electrophoresis in a Classroom	
09/22	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 6:	Methods cont- Polymerase Chain Reaction & Past Markers	C4/ C6
09/27	Introduction to PCR- <u>Molecular Xeroxing</u> Dot Blots- DQAlpha and Polymarker - <u>DNA battleship</u> Precautions against contamination	
09/29	Review for Exam 1: Student led reviews	
Week 7:	Exam 1 and Video	C1-C4/ C1-C6
10/4	Exam 1	
10/6	Video - Note: Lee will be at the International Human Identification Meeting	
Week 8:	Short Tandem Repeats and DNA databases	C5&C6/C7
10/11	Introduction to STR markers Reading- Moxon et al 1999. Sci Amer. 280: 94, Web Link- www.cstl.nist.gov/biotech/strbase Budowle et al. 2001. JFS 46:453-489 (CODIS STR Pop)	
10/13	Biology of STRs- Repeat Slippage, Mutation rates, Chromosomal Abnormalities and consequences on Forensic STR results <u>Additional Optional Readings</u> 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 9:	Data collection (instrumentation) and Interpretation	C9,10,11/C6-C8
10/18	DNA separation methods- Gels vs Capillaries	
10/20	STR detection methods - Introduction to Fluorescence Web link- http://www.probes.com/servlets/publications?id=144	
Week 10	Understanding STR results, Forensic Issues& DNA Databases	C16& C7/ C4&C8

10/25	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	
10/27	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	
Week 11:	Cold Hits, Unsolved crimes and Innocence and Exam II review	C16/ C9
11/1	DNA databases- Unsolved crimes and The Innocence Project	
11/3	Student Led Review for Exam II	C5, C6,C9, C10, C11 / C6, C7, C8, C9
Week 12	Exam II and Additional DNA Markers/Future DNA tech	C8/ C6
11/8	Exam II	
11/10	Gender typing, <u>Amelogenin and Y STRs</u> <i>or Is it a boy or a girl?</i> The "new" genetic markers- mtDNA and SNPs	
Week 13:	Quality Control, Validation and Traing Standards	C14 &App III/ C10
11/15	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	
11/17	<u>Educational standards for Forensic DNA analysts</u>	
Week 14	Admissibility Standards and Testimony	NA/ C11
11/22	Admissibility Standards 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	
11/24	Court Testimony	
Week 15	Legal and Ethical Considerations of DNA typing	See URLs
11/29	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	
12/1	<u>Innocence Project- Uses of DNA in exonerating the innocent</u> Exonerating the wrongfully convicted through postconviction DNA testing http://www.innocenceproject.org/ Convicted by Juries, Exonerated by Science- Case studies http://www.ncjrs.org/pdffiles/dnaevid.pdf	
Week 16	Future of DNA typing	
12/6	Future of DNA testing- MicroCE, SNPs, DNA arrays- Bead based methods, hand held??? http://www.ojp.usdoj.gov/nij/pdf/dna_studyreport_final.pdf	
12/8	Course Review for final exam Student Led Final Review Final Exam: TBA http://www.ojp.usdoj.gov/nij/sciencetech/dna_pub.htm	

Attorney General's Report on the DNA Evidence Backlog. The Attorney General submitted a report to Congress on April 2, 2004 that found approximately 542,700 criminal cases with biological evidence are awaiting DNA testing. These include 52,000 homicide and 169,000 rape cases. Only 10 percent of the unanalyzed cases are in State or local crime laboratories. The majority remain in the possession of local law enforcement agencies. The findings are based on a nation-wide survey and were reviewed by independent experts. The report is accompanied by information from United Kingdom officials that show DNA evidence at property crime scenes increased suspect identification by 44 percent.