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
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 Text:

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.htm-
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/:

Supplementary Texts (Optional)- Course material may include citations from the following:
http://vig.prenhall.com/catalog/academic/product/0,4096,0131118528,00.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
<table>
<thead>
<tr>
<th>Quizzes/Activities</th>
<th>100 points</th>
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<tbody>
<tr>
<td>Exam 1</td>
<td>100 points</td>
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<td>Exam 2</td>
<td>100 points</td>
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<td>Final exam</td>
<td>200 points</td>
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<td>Total required</td>
<td>500 points</td>
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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.

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<td>A+</td>
<td>483.5</td>
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<td>A</td>
<td>467</td>
<td>483.4</td>
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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:
<table>
<thead>
<tr>
<th>Dates</th>
<th>Topics</th>
<th>Butler/Inman</th>
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<tbody>
<tr>
<td><strong>Week 1:</strong></td>
<td><strong>Introduction and Overview of DNA and Crime</strong></td>
<td>C1/ C3&amp;C5</td>
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<td>08/25</td>
<td>Handouts-Syllabus- Reading material</td>
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<td>Introductions: Your background, my background</td>
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<td>Course Description, requirements, grading etc. Set up small student groups</td>
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<td><strong>Overview of Forensic DNA typing and History of Forensic DNA</strong></td>
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<td><strong>Assignment 1- Visit the following site- Introduction to DNA</strong></td>
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<td><a href="http://www.deakin.edu.au/forensic/Chemical%20Detective/DNA_Type.htm">http://www.deakin.edu.au/forensic/Chemical%20Detective/DNA_Type.htm</a></td>
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<td><strong>Optional reading: Weeden, VW- Unrealized potential of DNA testing -</strong></td>
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<td><strong>Week 2:</strong></td>
<td><strong>Basics of Physical Evidence</strong></td>
<td>NA / C1-C2</td>
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<td>08/30</td>
<td><strong>Introduction to Physical Evidence</strong></td>
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<td>Common Types of Physical Evidence. - The Significance of Physical Evidence.</td>
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<td>Locards Exchange Principle- Class vs Individual Characteristics</td>
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<td><strong>Biological Physical Evidence</strong></td>
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<td><strong>Optional CSI web links:</strong></td>
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<td><a href="http://www.crime-scene-investigator.net/">http://www.crime-scene-investigator.net/</a></td>
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<td><a href="http://www.profiling.org/journal/vol1_nol/jbp_ed_january2000_1-1.html">http://www.profiling.org/journal/vol1_nol/jbp_ed_january2000_1-1.html</a></td>
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<td><strong>Optional Laboratory Tour-</strong> Santa Clara County Crime Laboratory.</td>
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<td>Santa Clara County DA Crime Lab 1557 Berger Drive #B-2 San Jose</td>
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<td>09/01</td>
<td><strong>Collection and Preservation of Physical Evidence-</strong> Chain of Custody or The Real CSI</td>
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<td><strong>Special collection guidelines for Biological Evidence</strong></td>
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<td><a href="http://www.caenews.org/wordfiles/DNA%20SampleHandling.doc">http://www.caenews.org/wordfiles/DNA%20SampleHandling.doc</a></td>
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<td><strong>Additional Optional Readings</strong></td>
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<td><strong>Week 3</strong></td>
<td><strong>DNA Biology- The Scientific Basis for DNA typing</strong></td>
<td>C2/ C4</td>
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<td>09/06</td>
<td>No Class- Holiday</td>
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<td>09/08</td>
<td><strong>Introduction to DNA and Basic Human Genetics</strong></td>
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<td><strong>Scientific Basis for DNA typing - Why DNA?</strong></td>
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<td>Intro to Deoxyribonucleic Acid: Central Dogma- DNA extraction</td>
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<td><strong>Genetic Code, DNA Structure, Function and Replication</strong></td>
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<td>Cell Biology, Chromosomes, Genes and DNA markers</td>
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<td><strong>Basic Human Genetics- A tribute to Mom and Dad</strong></td>
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<td>Inheritance of DNA – Mendelian Genetics DNA variation and DNA Methods</td>
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<td><strong>Web links for DNA biology</strong></td>
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<td><a href="http://www.geneed.com/demo/index.html">http://www.geneed.com/demo/index.html</a> - Go to Methods in Molecular biology- Go to the fundamentals- section 6- DNA/RNA structure</td>
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<td><a href="http://www.blc.arizona.edu/Molecular_Graphics/DNA_Structure/DNA_Tutorial.HTML">http://www.blc.arizona.edu/Molecular_Graphics/DNA_Structure/DNA_Tutorial.HTML</a></td>
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JS 115 Fall 2004 p.3
Week 3:

Methods used in Forensic DNA

Sampling/Evaluation of Biological Evidence and DNA extraction C3/ C5&C6

09/13
Screening samples- Serology, Microscopy, Fluorescence or *Where is the DNA?*
Types and amount of samples required for DNA typing
References- www.fbi.gov/programs/lab/fsc/backissu/july1999/ponce.htm

09/15
DNA Extraction and Quantification or *How do they get DNA?*
Overview of Typing- Methods used to isolate DNA and Quantify DNA *How much DNA do they need?*
DNA from a Cougar- *Whos’ DNA is it? Human or Non-human?*

Week 5:

Methods continued- Assessing DNA variation C1/ C6

09/20
Evaluating DNA variation or *Does size matter?*
Introduction to RFLP - Electrophoresis in a Classroom

09/22
Introduction to Polymerase Chain Reaction – *Who wants to be a DNA billionaire?*
http://www.pcrlinks.com/generalities/introduction.htm

Week 6:

Methods cont- Polymerase Chain Reaction & Past Markers C4/ C6

09/27
Introduction to PCR- *Molecular Xeroxing*
Dot Blots- DQAlpha and Polymarker - *DNA battleship*
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
*Additional Optional Readings*
Walsh et al. 1996 NAR. 24:2807-2812,

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

JS 115 Fall 2004 p.4
10/25 Population Stats - Genetics - Hardy-Weinberg Equilibrium
Degraded DNA, PCR inhibition, contamination, Mixed samples and Interpretation

SWGDAM STR Interpretation Guidelines

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, Amelogenin and Y STRs or Is it a boy or a girl?
The “new” genetic markers - mtDNA and SNPs

Week 13: Quality Control, Validation and Training 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 Educational standards for Forensic DNA analysts

Week 14 Admissibility Standards and Testimony NA/ C11

11/22 Admissibility Standards
Frye, Daubert and Federal Rules of Evidence

11/24 Court Testimony

Week 15 Legal and Ethical Considerations of DNA typing See URLs

11/29 DNA and legal privacy issues
http://www.dnafiles.org/resources/res07.html#cat5

How DNA Technology Is Reshaping Judicial Process and Outcome
http://www.bc.edu/bc_org/avp/law/lwsch/journals/bciclr/24_2/05_FMS.htm

12/1 Innocence Project- Uses of DNA in exonerating the innocent
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???

12/8 Course Review for final exam Student Led Final Review
Final Exam: TBA
http://www.ojp.usdoj.gov/nij/sciencetech/dna_pub.htm

JS 115 Fall 2004 p.5
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.