Course Description:
This seminar will provide an opportunity for students to critically examine the legal, societal, and bioethical issues that arise from advances in genetics. Major areas will include forensic genetics, genetic privacy and databanks, and selected applications in medical genetics. Substantive areas such as forensic DNA databases, sibling and relative searching, quality control in forensic DNA, post-conviction DNA testing, forensic phenotype profiling, behavioral genetics, genetic discrimination, privacy and confidentiality, genetic testing and screening, gene therapy and genetic enhancement, race and genetics, gendicide, pharmacogenomics, stem cell and tissue culture research, cloning, eugenics, patenting and licensing of genetic technology, and genetically modified foods may be included. Specific topic selection will be based in part on student input with instructor approval. As this is a graduate seminar, students will be expected to critically analyze the topics and issues through readings, discussions, and oral and written analysis. A significant portion of the course grade is based on class participation therefore it is essential that students keep up with the reading and are active class participants. Readings will include recent journal articles, chapters from required and supplementary textbooks, on-line resources, publications and materials.

Additional Information
We are standing at the threshold of arguably the most exciting age in science. The explosive advances in genetic technology, instrumentation, computers and bio-informatics have turned many of our genetic dreams into reality. Major advances in genetics are transforming society, law, medicine, the economy, and our day-to-day lives. Examples of the impacts are found in diverse areas such as criminal law, health care, diagnostics, agriculture, and pharmaceuticals. One major outcome of these advances was the completion of the human genome three years ahead of schedule (2003 vs. 2006). The human genome contains a record of not only our evolutionary past, our shared ancestry and connection with all other organisms but also clues to our interactions with microorganisms and an understanding of the migration of humans across the globe. The use of forensic DNA typing has helped to solve tens of thousands of crimes and exonerate those wrongly accused. The impact on our lives is astronomical.

Genetic information may help predict our future health, our disease susceptibility, our individualized metabolic reactive potentials (aka Pharmacogenomics) and can be used to free the innocent, convict criminals and reunit family. The legal, societal and bioethical implications are astounding. Criminal justice professionals, such as forensic scientists, practicing attorneys, judges and policy makers, medical professionals such as doctors, pharmacologists, and genetic counselors and virtually every citizen is faced with the societal, bioethical and legal challenges and opportunities created by advances in genetics.

The course will begin with laying a foundation for understanding genetic testing, including basic genetics and the biochemistry of DNA as no prior study or knowledge of

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1 Sections of this greensheet were taken with permission from a course by Dr. Ann Lucas. JS 205. In addition, some seminar format and in class assignments from courses taught by Dr. Roy Roberg (JS 204) and Dr. Jan Johnston (JS 216) were also consulted to develop this syllabus.
genetics or molecular biology is required for the course. This will establish a working knowledge of the vocabulary, and fundamental molecular biology utilized throughout the course topics.

**Learning Outcomes**
Successful completion of this course will enable students to critically analyze the legal, ethical and societal issues that arise from advances in genetics including forensics, genetic privacy and medical genetic applications. Students will also have a basic foundation for understanding genetic testing, including basic concepts and vocabulary of genetics and the biochemistry of DNA. Students will be able to critically analyze the major topics- forensic genetics, genetic privacy and databanks, and selected applications in medical genetics through oral and written presentations, uses of examples, data and references to support knowledge claims and will be able to synthesize different perspectives and data to integrate main ideas and research findings from multiple sources.

**Course Text and materials: On line or at the Spartan Bookstore**

**Required Texts:**
Lazer, David. (2004). *DNA and the criminal justice system: The technology of justice*
http://www.dnapolicy.net/modules.php?name=Depository&d_op=viewDownload&eid=120&cat_list_id=2&min=10&orderby=dateD&show=10
***You will need to sign up for free access via www.dnapolicy.net*** Today!


**Note:** Various reading assignments in the tentative schedule, may be edited, augmented or supplemented depending on topic selection and the publication of new material.

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


Other required reading and internet materials:
Journal articles and other readings will be accessible via the SJSU library, on reserve or will be accessible on line. Citations and URLs for online materials will be provided in assignments during class. The web sites may include the following:

- Overview: National Institutes of Health: Ethical, Legal and Social Implications surrounding the availability of Genetic Information: Primer – to be distributed.

- Introduction to Genetics and Biochemistry of DNA:
  - Roche Education CD- To be distributed
  - PBS links on DNA: [http://www.pbs.org/saf/1202/features/genelinks.htm](http://www.pbs.org/saf/1202/features/genelinks.htm)
  - [http://www.dna.gov](http://www.dna.gov)

- Introduction to Forensic DNA and Short Tandem Repeats (STRs)

- Databases
  - Combined DNA Index System- DNA databases-[http://www.fbi.gov/hq/lab/codis/index1.htm](http://www.fbi.gov/hq/lab/codis/index1.htm)

- Genetics and Medicine
  - Gene Gateway-Exploring Genes and Genetic Disorders- A web companion to the human genome landmarks poster
  - Behavioral Genetics
  - Medicine and the New Genetics

- Ethics and legal privacy issues-
  - American Journal of Bioethics Resources: [http://bioethics.net/resources/](http://bioethics.net/resources/)
  - [http://www.dnafiles.org/resources/res07.html#cat5](http://www.dnafiles.org/resources/res07.html#cat5)
  - Bioethics: [http://www.bioethics.net/](http://www.bioethics.net/)
• Societal Interests and Civil Liberties
  o Center for Genetics and Society: http://www.genetics-and-society.org/resources/academics/1
  o UCLA Center for Society and Genetics: http://www.socgen.ucla.edu/symposium.htm

• “Race” to Human Variation
  o Nature Genetics 36, S8 - S12 (2004) Published online: ; http://www.nature.com/ng/journal/v36/n11/s/index.html
    • Changing the paradigm from 'race' to human genome variation ppS5 - S7 Charmaine D M Royal & Georgia M Dunston Published online: 26 October 2004 | doi:10.1038/ng1454 http://www.nature.com/ng/journal/v36/n11s/pdf/ng1454.pdf
    • What we do and don't know about 'race', 'ethnicity', genetics and health at the dawn of the genome era ppS13 - S15 Francis S Collins. Published online: 26 October 2004 | doi:10.1038/ng1436

• Legal Resources
  o Smith, Alling and Lane: http://www.dnaresource.com/
  o National Human Genome Research Institute: http://www.genome.gov/11510209
  o Smith, Alling and Lane: http://www.dnaresource.com/

Olafur Einarsson
Denver DA DNA Resource: http://www.denverda.org/DNA/DNA_INDEX.htm
National District Attorney’s Association/American Prosecutors- Research Institute. DNA Legal Assistance Unit
Innocence Project http://www.innocenceproject.org/
American Society of Law, Medicine and Ethics:
http://www.aslme.org/dna_04/index.php
Science: When should judges admit or compel genetic tests:

Videos (Availability and Time permitting)
- PBS resources link page: http://www.pbs.org/bloodlines/resources/related.html

Course requirements and Grading:
A significant portion of the course grade is based on class participation therefore it is essential that students keep up with the reading and are active class participants. Readings will include recent journal articles, chapters from required and supplementary textbooks, on-line resources and publications and materials. Note: Various reading assignments in the tentative schedule, may be edited, augmented or supplemented depending on topic selection and the publication of new material.

Submission of Discussion Questions and Three Critical Issues (15% each – total =30%): You are responsible for keeping up with the assigned reading and being prepared to discuss them in class. Before class, everyone is required to submit a set of five discussion questions (DQs) based on that week’s readings. In addition, you will be required to identify and summarize a minimum of three critical issues (TCIs) from each of the week’s readings. Summaries of 1 paragraph per TCI (3 paragraphs total) will be required as typed, double spaced, 12 point font documents. The DQs and TCIs must be emailed by 3:00 PM on the day of class. Email to steven.lee@sjsu.edu, or drop off in MH 521. You must also bring hard copies of your DQs and TCIs to the class. Submission of the DQs = 15% and summaries of TCIs = 15% of your total grade. Note that each week there are assigned readings, you are required to hand in DQs and TCIs. Late submissions will not be accepted.

Participation (5%): Each week, one to two students selected randomly (depending on class size) will be responsible for leading the discussion of that week’s reading. For in class participation, you will be able to earn 5%. Every week you will be graded on your participation. 5 points will be awarded to students who participate fully each week including leading the discussion if it is your week, being on time, providing several comments and questions during the seminar and on occasion, bringing to light additional information and references relevant to the topic. “Moderate” participation (a few comments or questions made, or students who participate considerably but arrive more than 15 minutes late or leave more than 15 minutes early) will be awarded 3 points. Minimal participation will be awarded 1 point. Students who are completely silent or are absent will receive no participation points. These will be tabulated and averaged for your final participation grade. Note that, it is also important that you be able to discuss chapter and reading contents beyond what you have written in the TCIs and DQs.
Research Paper (50%): A single final paper for this course is required and is worth 50% of your grade. Each paper should be approximately 15 pages of text (no more than 10), typed and double-spaced, in 12-point font and black ink, with standard 1-inch margins and references in APA style. Students must hand in original papers for this class. Copies of papers completed in previous classes, or papers largely adapted from previous classes, are unacceptable and, if submitted, will be considered a violation of academic integrity. This will result in severe consequences that may include failing the paper, failing the course and expulsion from SJSU.

The questions guiding your paper will be developed jointly by the instructor and students during the first three weeks of the seminar on the topics under consideration. Each student must select a different topic. In the remaining weeks before the paper is due, students will undertake library research and generate a minimum of 10 additional recent (within the past five years), directly relevant, scholarly articles or books on the topic and will include no less than at least 5 peer-reviewed journal articles. These recent articles must be directly related to the questions under consideration. The paper must show the capacity to undertake a literature review for the purpose of critical analysis of the questions. Copies of the recent articles obtained from library research must be attached as an appendix to each paper.

As this is a graduate seminar, the students and instructor share the responsibility for the success of the learning experience. The expectation is that each student is able to initiate a literature search and write a review of the relevant material. Any student who has a concern about the content, format and quality of this undertaking is invited to bring in a draft to me during office hours three weeks prior to the date the paper is due for my comments and suggestions.

Note on paper formats and grading: page numbering begins on the first page of text (your cover page, if you use one, is not page 1, and your bibliography does not count as a page of text). Papers that are too short or too long, including papers using 1.5 or triple spacing instead of double spacing, will be penalized. Attached to this syllabus is the evaluation and scoring rubric I will use to grade your papers.

Presentations (15%): You will give a 30-40 minute presentation to the class on your topic, and distribute a one-page summary to the rest of the class and the instructor. Your written summary may be in outline or narrative form, and may be single-spaced if you choose. Use 10-point font or larger for your summaries, and be sure to include your name and topic. In addition, one week before you must submit a reading for the entire class on your topic. The length of your presentations will depend on the number of students enrolled in the class, but plan at least 30 minutes and allow time for questions. Please practice your presentations: you need to cover your main points clearly and concisely, and you will be cut off if you talk for too long. Thus, to get a good grade for your presentation, you can’t “wing it”. You may simply do an oral presentation, or you may bring in overheads or Power Point displays. Students will be expected to provide oral critiques of the summary and presentations.

<table>
<thead>
<tr>
<th>Grading</th>
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<tbody>
<tr>
<td>Final Research Paper (Due May 10th)</td>
<td>50%</td>
<td>250 points</td>
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<tr>
<td>Presentation</td>
<td>15%</td>
<td>75 points</td>
</tr>
<tr>
<td>DQs</td>
<td>15%</td>
<td>75 points</td>
</tr>
<tr>
<td>TCIs</td>
<td>15%</td>
<td>75 points</td>
</tr>
<tr>
<td>Participation</td>
<td>5%</td>
<td>25 points</td>
</tr>
<tr>
<td>Total required</td>
<td>100%</td>
<td>500 points</td>
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</table>
Extra Credit
A total of 10 points may be granted for students that provide summaries of new (2006), peer reviewed articles on a relevant topic of the week. Students must bring a copy of the new article and provide a 200 word summary (no longer than 1 page) with 3 discussion questions and TCIs for the article. Each assignment will be worth 1 point each. The extra credit assignments will be graded and tabulated by the instructor. These will be returned at the end of the semester upon request.

Grading Policies

<table>
<thead>
<tr>
<th>Grade</th>
<th>From</th>
<th>To</th>
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</thead>
<tbody>
<tr>
<td>A+</td>
<td>483.5</td>
<td>500</td>
</tr>
<tr>
<td>A</td>
<td>467</td>
<td>483.4</td>
</tr>
<tr>
<td>A-</td>
<td>450</td>
<td>466.9</td>
</tr>
<tr>
<td>B+</td>
<td>433.5</td>
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<tr>
<td>B</td>
<td>417</td>
<td>433.4</td>
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<tr>
<td>B-</td>
<td>400</td>
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<tr>
<td>C+</td>
<td>383.6</td>
<td>399.9</td>
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<tr>
<td>C</td>
<td>367</td>
<td>383.4</td>
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<tr>
<td>C-</td>
<td>350</td>
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<tr>
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<td>317</td>
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<tr>
<td>D-</td>
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<td>316.9</td>
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<tr>
<td>F</td>
<td>&lt;300</td>
<td></td>
</tr>
</tbody>
</table>

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 (full member and candidate for fellow 2006), 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.
Tentative Course Schedule (subject to change with fair notice):

<table>
<thead>
<tr>
<th>Dates</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 Jan</td>
<td>Welcome - Introduction, overview, seminar organization.</td>
</tr>
</tbody>
</table>

- Sign in. Ice Breakers - Course Description, requirements, grading, handouts-
- Syllabus- Reading material – Texts, articles, URLs.
- Introduction/Review of Genetics and Molecular Biology
  - Weblink demo- [www.dnapolicy.net](http://www.dnapolicy.net)

Required Reading:

- Primer (on line and on disk) Genomics and Its Impact on Science and Society: The Human Genome Project and Beyond
- *Introduction to DNA*: Web links for DNA biology
  [http://www.geneed.com/demo/index.html](http://www.geneed.com/demo/index.html) - Go to Methods in Molecular biology- Go to the fundamentals- section 6- DNA/RNA structure

No DQs or TCIs are required for this week.

Resources:

- Roche Genetics Education CD: Produced by CMG.
  [http://www.genomicglossaries.com/content/printpage.asp?REF=/content/DNA.asp](http://www.genomicglossaries.com/content/printpage.asp?REF=/content/DNA.asp)
- PBS links on DNA:
  [http://www.pbs.org/saf/1202/features/genelinks.htm](http://www.pbs.org/saf/1202/features/genelinks.htm)

2/1

**Introduction to genetics and DNA – continued**

**Introduction to Forensic DNA Profiling**

- History of Forensic Testing-
- Forensic DNA testing methods-PCR, STRs, mtDNA, Y STRs
- An introduction to Forensic DNA Databases- CODIS

Readings –

- L: Chapters 2 and 4
- **Introduction to PCR**: Visit these sites and explore until you feel you understand PCR

- NCJRS publication: The future of forensic DNA testing:
- R&I Chapters 4, 5 and 6 (Optional for this week but will be required when available at the bookstore)
Interpreting Results: CODIS- DNA Databanks- Legal Issues -searches

Interpreting STR results, Levels of CODIS, QC, Searching, sample collection DNA Database Laws- International DNA databases- Population issues and statistics, Privacy and Databases

Readings-
- L- Chapters 9, 10, 11, 12, 14
- R&I Chapter 7, 8, 9 and 10
- Other URLs to be assigned from ASLME
- SWGDAM STR Interpretation Guidelines
- Combined DNA Index System- Value of DNA databases
  http://www.fbi.gov/hq/lab/codis/index1.htm
- Other readings may be added- Nature genetics supplement Nov 2004
- Optional readings:
  - B&H Chapters 26, and 28

Legal and Ethical Considerations of DNA typing: Privacy and Databases continued and Admissibility, QC Standards,

Required Reading

R&I Chapter 11
Innocence Project- Uses of DNA in exonerating the innocent
Convicted by Juries, Exonerated by Science
http://www.ncjrs.org/pdffiles/dnaevid.pdf

Other resources:
Smith, Alling and Lane: http://www.dnaresource.com/
State & Federal Challenges to the Constitutionality of DNA Databases (NCSL) http://www.nesl.org/programs/health/genetics/dna.htm
Denver DA DNA Resource:
http://www.denverda.org/DNA/DNA_INDEX.htm

DNA and legal privacy issues
http://www.dnafiles.org/resources/res07.html#cat5
Ethics of Genetic Testing
http://www.nhgri.nih.gov/12010621

Bloodlines or ASLME Video- Workshop 1 – Lee at AAFS
Readings to be assigned.

Medical Genetics, Law and Society- Overview of applications and research
Stem cell research, cloning, gene therapy, ethical legacy of Nazi medical war crimes, animals and biotechnology, genetic engineering
Readings: B&H Chapters 1-4, S Chapter 10
Readings may be edited, augmented and/or supplemented.
3/08  **Gene Manipulation and Gene Selection**
Genetic choice, cloning public policy, ethics of human embryonic stem cells
Pre implantation genetic diagnosis and embryo selection- eugenics
B&H Chapters 11-17 S Chapters 1, 2, 5, 8
Readings may be edited, augmented and/or supplemented.

3/15  **The Business of Genetic Testing:**
Insurance and Discrimination, Commercialization and Patenting
Property Patents and Genetic Material, Genetically modified organisms
B&H chapters 29-34, S Chapter 9
Readings may be edited, augmented and/or supplemented.

3/22  **Social and Cultural Issues of genetic testing**
Sex, Law and Society- Will Males cease to exist?
Readings to be assigned.


4/5  **Graduate Student Presentations: Topics to be determined**
1
2

4/12  **Graduate Student Presentations: Topics to be determined**
3
4

4/19  **Graduate Student Presentations: Topics to be determined**
5
6

4/26  **Graduate Student Presentations: Topics to be determined**
7
8

5/3  **Graduate Student Presentations: Topics to be determined**
9
10

5/10  **Final Papers Due- Continued Graduate Student Presentations if needed**
Future of Genetic Testing
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 Judicial Affairs 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/judicial_affairs/students/academic_integrity.html.

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. 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.

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 register with DRC to establish a record of their disability.”