Biology 192- Heredity and Society Spring 2008

Course description: *Heredity and Society* is an applied human genetics course for non biology majors. It satisfies the F4 LinC graduation requirement. The course includes classical and current topics in human genetics such as single gene and polygenic traits and diseases, chromosomal syndromes, molecular (biochemical) genetics, population genetics, immunogenetics, and cancer genetics. Evaluation will include four unit exams, lecture and laboratory attendance and participation, involvement in case studies, and presentation of a short power point presentation on a selected human genetic disease.

Course information:

Lectures - MWF 4 (11:30 - 12:20 AM)
Laboratory - Tuesday (12:45- 3:45 PM) Collier Hall of Science 300

Instructor: Dr. Karen Kurvink
Associate Professor of Biology
323 Collier Hall of Science
610-861-1428

Text; HUMAN GENETICS - Concepts and Applications
eighth edition by Ricki Lewis 2008

Course goals:

1. To investigate historical and current concepts and technologies in human genetics.

2. To focus on investigatory laboratory procedures and technologies associated with human genetics.

3. To demonstrate the evolutionary 'conservation in design" of humans and other biological organisms.

4. To improve student's deductive and articulation skills via computer data base searches, written research assignments, and verbal presentations.

5. To encourage the development of understanding and hopefully of empathy for individuals who have genetically related differences.

Course comments:

1. Four unit exams: l00 pts each
   Exams include short answer, problems, and essay questions.

2. Student presentation: l0 minute power point presentation
   on a selected human genetic syndrome - l00 pts
   (Note: As soon as you have selected a topic, inform the instructor so it can be added to a "selected topic" list to avoid duplication of topics.)
   a. identify if the condition is a single gene, polygenic, or
   b. include pattern of inheritance and/or empirical risk data
   c. indicate the population frequency of occurrence
   d. describe the clinical symptoms
   e. indicate if screening procedures are available
   f. what counseling information is important
   g. is gene therapy available
   h. indicate resources - OMIM, genetests, NORD, or other data bases
   i. be sure to include a bibliography slide at the end of your presentation

3. Attendance and participation grade: It is essential to be involved in the course. (This involvement includes lecture and laboratory attendance.
   a. Each lab is evaluated based on 20 pts possible points.
   b. The lecture grade is based on l00 pts possible points.

4. Contracting: If you have a specific topic you are interested in studying independently, you may contract for completion of that work with the professor. (NOTE: This is an optional addition to the course.)

5. Grade: The course grade is based on earned points/possible points. This percentage grade will translate into the following letter grade:
   90-100% = A

80-89% = B
70-79% = C
60-69% = D
below = F

TENTATIVE LECTURE SCHEDULE

Date	Lecture Topic	Assignment
Mon Jan14	Course introduction The meaning of "normal" Prenatal genetic screening - Down syndrome	Ch 1
Wed Jan 16	Cells Mitosis and mitotic cell cycle Stem cells	Ch 2
Fri Jan 18	Reproductive systems Meiosis	Ch 3: 41-43 3: 43-50
Mon Jan 21	Martin Luther King Day - no class	
Wed Jan 23	Development Birth defects Aging	Ch 3: 50-57 3: 58-60 3: 60-67
Fri Jan 25	Basic Genetics	Ch 4: 69-88
Mon Jan 28	Mendelian exceptions Mitochondrial inheritance Linkage	Ch 5: 89-97 5: 97-98 5: 98-106
Wed Jan 30	Sexual development Sex linked inheritance X-inactivation Genomic imprinting	Ch 6: 107-115 6: 115-123 6: 123-124 6: 124-130

Fri Feb 1 Exam 1 (Chapter I-5)

Mon Feb 4	Multifactorial inheritance continuous traits/disease	Ch 7
Wed Feb 6	Multifactorial inheritance threshold traits/disease	Ch 7
Fri Feb 8	Behavior genetics	Ch 8
Mon Feb 11	DNA structure and replication	Ch 9
Wed Feb 13	Protein synthesis protein characterization transcription translation	Ch 10

Fri Feb 15 Exam 2 (Chapters 6-l0)

Mon Feb 18	Control of Gene Expression	Ch 11
Wed Feb 20	Gene mutation causes types	Ch 12: 213-228
Fri Feb 22	Gene Families DNA Repair	Ch 12: 228-229 12: 230-237
Mon Feb 25	Chromosomes structure variation	Ch 13
Wed Feb 27	Down syndrome causes	Ch 13: 248-251 13: 256-258
Fri Feb 29	Population genetics	Ch 14 (omit 270-275)
March 1 - 9	**Spring break**	

Mon Mar 10	Forces of evolution	Ch 15
Wed Mar 12	Human origins mt DNA studies Y chromosome racial groups	Ch 16: 301-319
Fri Mar 14	Eugenics past present	Ch 16: 319-325

Mon Mar 17 Exam 3 (11-16)

Wed Mar 19	Immunogenetics importance of cell surfaces blood types MHC innate immune response adaptive immune response B cells T cells	Ch 17: 327-331 17: 332-334 17: 334-338
Fri Mar 21	Good Friday - no class	
Mon Mar 24	Easter Monday - no class	
Wed Mar 26	Immunogenetics inherited immune deficiencies acquired immune deficiencies autoimmunity allergies vaccinations tissue/organ transplants MHC region of genome	Ch 17:338-352
Fri Mar 28	Cancer genetics features of cancer history of cancer genetics cancer associated genes	Ch 18

	oncogenes tumor suppressor genes	
Wed Apr 2	Cancer genetics cancer models cancer diagnosis/treatment causes of cancer cancer prevention	Ch 18
Fri Apri 4	Genetic Technologies DNA sequencing patenting DNA amplifying DNA - PCR manipulating DNA recombinant DNA technology	Ch 19
Mon Apr 7	Genetic technologies microarrays high throughput screening	Ch 19
Wed Apr 9	DNA fingerprinting	Ch 14:270-276
Fri Apr 11	Genetic testing/counseling Gene therapy	Ch 20
Mon Apr 14	Reproductive technologies	Ch 21
Wed Apr 16	Genomics/proteomics	Ch 22
Fri Apr 18	Student presentations/discussion	
Mon Apr 21	Student presentations/discussion	
Wed Apr 23	Student presentations/discussion	
Fri Apr 25	Student presentations/discussion	

Final exam - unit exam 4 (during final exam period)

Tentative Laboratory Schedule

Week 1 (Jan 15)	Introduction to the microscope Karyotype analysis exercise Cystic fibrosis (case study) Introduction and evaluation of OMIM genetests NORD
Week 2 (Jan 22)	Slide study of mitosis Pedigree construction a genotype/phenotype exercise Computer sites: OMIM and genetests
Week 3 (Jan 29)	Meiosis slide study spermatogenesis oogenesis) pregancy related technologies -ultrasound -amniocentesis -PGD (preimplantation genetic diagnosis) Assign genetic problems
Week 4 (Feb 5)	Sex chromatin slide preparation procedure Genetic problems help session Case studies involving gender
Week 5 (Feb 12)	Isolation and characterization of DNA Construction of DNA models Evaluation of the genetic and environmental aspects of alcoholism Case study involving “fetal alcohol syndrome”
Week 6 (Feb 19)	Protein synthesis- construction of models and use of the genetic code chart Agarose electrophoresis experiment

	demonstrating DNA separation
Week 7 (Feb 26)	Population genetics exercise - Hardy Weinberg analysis
Week 8 (March 3-7)	Spring Break
Week 9 (March 11)	Human evolution lab - evaluate skulls Construction of a phylogenetic tree Eugenics exercise - evaluate historical and current situations
Week 10 (March 18)	Dermatoglyphic analysis exercise- genetic evaluation of human fingerprint
Week 11 (March 25)	Genetic engineering lab - *E.coli* transformation experiment Video: Historical genetic documentary
Week 12 (April 1)	DNA fingerprinting (profiling) - history and hands-on technology exercise
Week 13 (April 8)	Genetic screening for PKU history and screening technologies Case study - PKU
Week 14 (April 15)	Genetic counseling methodology Assisted reproductive technologies
Week 15 (April 22)	TBD

Bio l92: ***Heredity and Society*** was designed as an alternative lecture and laboratory LinC F4 exposure (particularly as related to Biology l00 - *Principles of Biology* which has an important animal dissection component). The lectures focus on the narrower discipline of human genetics and associated societal concerns. The laboratory portion of the course contains exercises which demonstrate the scientific investigatory process, expose students to scientific equipment and human genetic technology, and foster awareness of genetic data bases relevant to human genetic diseases. The course could be taught in either the Fall or Spring semester. In the

semesters when it has been taught, it has drawn students from a variety of majors and academic levels. It is not a course intended for biology majors; however, it could potentially be taken as a general elective. (There is a major course in Human Genetics which is more appropriate for them.) The course could be taught by a number of individuals in the biology department and does not require significant library and/or media resources.

The **catalog description** is: *Heredity and Society* is an applied human genetics course for non biology majors. It satisfies the F4 LinC graduation requirement. The course includes classical and current topics in human genetics such as single gene and polygenic traits and diseases, chromosomal syndromes, molecular (biochemical) genetics, population genetics, immunogenetics, and cancer genetics. Evaluation will include four unit exams, lecture and laboratory attendance and participation, involvement in case studies, and presentation of a short power point presentation on a selected human genetic disease.