

**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 brief power point presentation on a selected genetic topic.

**Course information:**

Lectures - MWF 2 Collier Hall of Science 202

Laboratory - Thursday (12:45- 3:45 PM) CHS 301

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

**Text:** **HUMAN HEREDITY - Principles and Issues**  
eighth edition by Michael Cummings 2009

**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: 100 pts each  
Exams include short answer, problems, and essay questions.
2. Student presentation: 10 minute power point presentation on a selected genetic condition - 100 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.)  
For example: In single gene conditions include the following:
  - 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. Each lecture unit exam grade is based on 100 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 and the number of possible points should be included in the contract.)
5. Grade: The course grade is based on earned points/possible

points. This percentage grade will translate into the follow letter grade:

90-100%	=	A
80-89%	=	B
70-79%	=	C
60-69%	=	D
below	=	F

Plus or minus will be added as appropriate for each student's grade.

### Tentative Lecture Schedule

Aug 25 (M)	Perspective on human genetics	Chapter 1:1-17
Aug 27 (W)	Cell division – mitosis	Chapter 2:18-29
Aug 29 (F)	Cell division - meiosis	Chapter 2:29-43
Sept 1 (M)	Labor Day – no classes	
Sept 3 (W)	Mendel's laws	Chapter 3:44-53
Sept 5 (F)	Genetic terminology	Chapter 3:53-69
Sept 8 (M)	Single gene Mendelian patterns autosomal dominant autosomal recessive	Chapter 4:70-81
Sept 10 (W)	Single gene Mendelian patterns X-linked dominant X-linked recessive Y-linkage	Chapter 4:82-99
Sept 12 (F)	Polygenic inheritance	Chapter 5:100-114
Sept 15 (M)	Polygenic inheritance	Chapter 5:115-127
Sept 17 (W)	Cytogenetics Autosomal syndromes Down syndrome	Chapter 6:128-144
Sept 19 (F)	<b>UNIT EXAM 1</b> (Chapters 1-5)	

Sept 22 (M)	Cytogenetics Sex chromosomal syndromes Fragile X syndrome	Chapter 6:145-157
Sept 24 (W)	Early development Sex determination Teratogens	Chapter 7:158-173
Sept 26 (F)	Role of hormones in sexual development X-inactivation	Chapter 7:173-187
Sept 29 (M)	Nucleic acids: DNA and RNA	Chapter 8:188-200
Oct 1 (W)	Chromosome structure DNA replication	Chapter 8:200-209
Oct 3 (F)	Protein synthesis overview	Chapter 9:210-229
Oct 5 (M)	Fall recess – no class	
Oct 8 (W)	Protein synthesis details	
Oct 10 (F)	Genetic errors in metabolic pathways PKU Lactose intolerance	Chapter 10:230-241
Oct 13 (M)	Genetic errors in hemoglobin Sickle cell anemia	Chapter 10:242-257
Oct 15 (W)	<b>UNIT EXAM 2 (6-10)</b>	
Oct 17 (F)	Mutations	Chapter 11:258-272
Oct 20 (M)	Mutation repair	Chapter 11:273-283
Oct 22 (W)	Genes and cancer Oncogenes Tumor suppressor genes	Chapter 12:284-292
Oct 24 (F)	Cancer models Chromosomal specific modifications	Chapter 12:293-305
Oct 27 (M)	Recombinant DNA technologies Restriction enzymes Polymerase chain reaction	Chapter 13:306-329

### Southern blotting

Oct 29 (W)	Genetically modified organisms	Chapter 14:330-340
Oct 31 (F)	Genetic screening Genetic profiling	Chapter 14:341-357
Nov 3 (M)	Population genetics	Chapter 19:456-467
Nov 5 (W)	Microevolution	Chapter 19:468-478
Nov 7 (F)	<b>UNIT EXAM 3</b> (11-14)	
Nov 10 (M)	Genetics of race/eugenics	
Nov 12 (W)	Human genome project Genomics Proteomics	Chapter 15:358-381
Nov 14 (F)	Reproductive technologies	Chapter 16:382-391
Nov 17 (M)	Gene therapy Gene counseling	Chapter 16:391-401
Nov 19 (W)	Immunogenetics Adaptive response	Chapter 17:402-414
Nov 21 (F)	Immunogenetics Blood types Organ transplantation Allergies Autoimmune diseases	Chapter 17:415-429
Nov 24 (M)	Behavior genetics Single gene conditions Multifactorial conditions Schizophrenia Depression	Chapter 18: 430-445
Nov 26 (W)	Thanksgiving holiday	
Nov 28 (F)	Thanksgiving holiday	
Dec 1 (M)	Social genetic conditions Musical skills	Chapter 18: 446-455

Athletic skills  
Alcoholism  
Sexual identity and orientation

Dec 3 (W) Student presentations

Dec 5 (F) Student presentations

Dec 8 (M) Student presentations

Dec 10 (W) Student presentations

**FINAL EXAM – UNIT EXAM 4** (Chapters 15 – 19)

Lab 1 - August 28

Microscope - mitosis

Karyotype

Introduction to computer web sites: OMIM/genetests

Selected condition - Autosomal dominant genetic disease: Huntington disease

Lab 2 - September 4

Microscope – meiosis

Human traits (phenotypes and genotypes)

Selected condition - Autosomal recessive genetic disease: Cystic fibrosis

Lab 3 - September 11

Genetic problems

Pedigree pattern analysis

Selected condition - Proteus syndrome (autosomal dominant?)

Lab 4 - September 18

Autosomal and sex chromosome cytogenetic syndromes

Dermatoglyphics exercise

Selected condition - Down syndrome (Trisomy 21) – amniocentesis decisions

Lab 5 - September 25

Human chromosome cultures (set up on Monday Sept 22 and harvest during lab)

Lab 6 - October 2

DNA isolation

DNA models

Study human chromosome slides – select mitoses for photographing

Special consideration: Watson/Crick's contribution to genetics (Cold Spring Harbor)

- Lab 7 - October 9  
Protein synthesis model  
Exercise on identification of specific proteins using an ELISA immunoassay  
Selected conditions involving the head and facial development  
Treacher-Collins syndrome
- Lab 8 - October 16  
*Serratia marcescens* mutagenesis  
Agarose electrophoresis exercise – diagnosis of sickle cell anemia  
Selected condition: Sickle cell anemia (autosomal recessive)
- Lab 9 - October 23  
Bacterial transformation exercise – Production of *E. coli* that glow in the dark  
DNA sequencing – Sanger’s dideoxy sequencing  
Special consideration: Venter and Collins contribution to human genome mapping
- Lab 10 – October 30  
Agarose electrophoresis exercise – DNA profiling  
Special consideration: Alex Jeffrey’s DNA fingerprinting case (1st forensic application of DNA fingerprinting)
- Lab 11 - November 6  
Population genetics lab – confirmation of Hardy Weinberg equilibrium principle
- Lab 12 - November 13  
Phylogenetic tree  
Eugenics  
US  
Germany  
Special consideration: Events associated with Hitler’s racial hygiene program
- Lab 13 - November 20  
Evolution discussions  
\*Tourette syndrome – behavior genetics
- Lab 14 - November 27 Thanksgiving Holiday
- Lab 15 - December 4 Student presentations