

## Human Heredity & Birth Defects

Biology 270 and Lab - 4 credit hours  
Lauri Miller, Instructor of Biology  
Saint Joseph College Honors Program  
Agnes Curry, Director

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**Course Description:** This course covers topics including: DNA and genes; cell structure and control; what causes genetic disease, including single trait disorders, multifactorial inheritance, chromosomal abnormalities and mitochondrial disorders; autosomal and sex-linked inheritance; genetics of behavior; reproductive technologies; genetic testing and counseling, genetic engineering and therapy. The volume of genetic discoveries and technology has exploded in the last few years. New technologies have implications far beyond the science involved. Students are required to write 3 short essays throughout the semester; the essays are 2- 3 pages long and must include: (1) the scientific basis, (2) the ethical implications, (3) opinion on the issue. There is no right or wrong answer; the objective is to have students start thinking about issues that society will most likely face in the near future. Students are required to write and present a research paper on a genetic disorder that is of particular interest to them. This course also includes a weekly laboratory section where we explore in detail some of the technologies that we are studying.

### Texts:

Lewis, Ricki. 2008. *Human Genetics: Concepts and Applications*, 8th Edition. McGraw- Hill Companies. ISBN: 0-07-299539-8.

Gilbert, Scott. 2005. *Bioethics And The New Embryology: Springboards For Debate*. Sinauer Associates, Inc and W. H. Freeman & Company. ISBN: 0-7167-7345-7. This book contains supplemental material addressed in the course. It also provides the basis for some of the ethical issues as we now have the ability to alter the course of human development.

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## Syllabus

Date	Topic
Week 1	Overview of Human Genetics
Week 2	Genes & Disease Risk, Bioethics, DNA Structure and Replication
Week 3	<b>Quiz 1</b> , DNA Models, Gene Action: From DNA to Protein/ Transcription
Week 4	Cells – Cell Cycle, Plasma Membranes, Cytoskeleton, Stem Cells <b>Should We Use Stem Cells To Repair the Body?</b> <b>Should We Allow Humans to Be Cloned?</b>
Week 5	Gene Action: From DNA to Protein/Translation <b>EXAM 1</b>

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Week 6 Meiosis and Human Development  
**When Does Life Begin?**

Week 7 **Quiz 2**, Abnormal Development

Week 8 Single Gene Inheritance-Test Cross, Dihybrid Cross , Pedigrees  
**Problem Set 1**  
**EXAM 2**

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Week 9 Beyond Mendel's Laws, Incomplete Dominance, Penetrance, Mitochondrial Disorders, Genetic Essentialism

Week 10

Matters of Sex, X-Linked Diseases, X-Inactivation

**Problem Set 2**, Reproductive Technologies

**Should Assisted Reproductive Technologies**

**Be**

**Regulated?/ Arguments For and Against Sex**

Week 11 **Selection**

Multifactorial Traits Chromosomes, Chromosomal Disorders

Week 12 **Problem Set 3**

Genetics of Behavior

**EXAM 3**

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Week 13 Genetic Testing and Treatment, Genomics, Human Genome Project

Week 14 Recombinant DNA Technology

**Should We Modify the Human Genome?**

**Do You Want Your Genome Sequenced?**

Week 15 **FINAL EXAM**

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### **Laboratory Schedule**

#### **Date**

#### **Topic**

Lab 1 Scientific Method, How to write a Laboratory Report, Isolation of DNA

Lab 2 Transcription and Translation (Sickle Cell Anemia)

Lab 3	Cell Division – Mitosis in Onion Root Tips
Lab 4	<i>Ascaris</i> Fertilization/ When Does Life Begin?
Lab 5	Population Genetics: Trait Wheel, Coin Toss, Paper Tasting
Lab 6	Cat Lab (Single Inheritance and Sex-linked Inheritance)
Lab 7	IVF Discussion/ Designer Babies video Part 1
Lab 8	mtDNA isolation and PCR
Lab 9	mtDNA isolation and PCR
Lab 10	mtDNA isolation and PCR
Lab 11	Presentations
Lab 12	Presentations

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**Grading Policies :**

<b><u>Opportunity</u></b>	<b><u>% of Grade</u></b>
In-class exams (3)	30% (10% each)
Final Exam	10 %
Research paper (1)	10 %
Presentation	10%
Short essays (3)	15%
Quizzes/Problem sets	15 %
Laboratory Reports/Handouts	

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