Specific course objectives (items you are expected to know and use by the end of the course)

A. Chromosomes and chromosome mechanics
   1. Events of mitosis and meiosis; chromosome mutations in mitosis and meiosis
   2. Importance of meiotic stages, their relationship to chromosome mutations
   3. Features of the karyotype: chromosomes in pairs, X & Y chromosomes, nucleolar organizers, chromosome size; molecular structure of the chromosome

B. Mendelian Genetics
   1. Dominance and recessiveness; segregation, independent assortment, genetic ratios, apparent exceptions to the Mendelian principles
   2. X-linkage, autosomal linkage, relationship of Mendelian genetics to chromosomes
   3. Use of genetic symbols, use of markers in genetics, gene mapping

C. Molecular genetics
   1. Evidence for DNA as the genetic material, semi-conservative replication of DNA and chromosomes; gene and polypeptide relationship, gene fine structure
   2. Process of DNA replication, transcription, translation, post transcriptional modification, control of protein synthesis, function of the operon
   3. Examples of eukaryotic gene organization: introns and exons, gene amplification, X-chromosome inactivation, euchromatin, heterochromatin (facultative and constitutive), promoter sequences, pseudo genes, genes and mutations
   4. Techniques of nucleotide sequencing, cloning, DNA libraries, PCR

D. Relationship of Mendelian and Molecular Genetics (beta-globin gene used as an example)

E. Be able to speak the language of genetics

F. Know tests for: dominance and recessiveness, autosomal and sex linkage, linked mutations, allelism, mutations at same or different sites.

Some notes on the general conduct of the course

The course is divided into lecture and recitation periods. During lectures we introduce new materials and give explanations and examples which try to make the materials more understandable.

Recitation is primarily a safe and relaxed time to review items discussed in lecture and to work out suggested text problems. This time may occasionally be used to introduce new materials. The problems are for your own use; they are not to be turned in. There will be a 15 min. quiz at the beginning of each recitation. These are given to insure that you are understanding the information before exam time. Quiz grades are for your own use; you can get some idea of how well you are doing in the course. Some quizzes will be collected and grades recorded but the grades do not count for your final course grade; they give me some idea of how well you are doing before the midterm and final exams. Please come on time and you may leave at anytime.

Recitations will follow this general format: 1. take the quiz (15 Min); 2. quickly go over the answers to the quiz; 3. review and detailed discussion of the topics covered by the quiz; 4. preview of upcoming materials or additional materials if we are behind schedule (announced in advance); 5. floor is open for all questions.

Relative to exams and the grading system: The midterm exams (each one hour long) are worth 25% each and the final examination (1 hour, 50 min. long) accounts for 50% of the course grade. Grades: 100-93 = A; 90-92 = A-; 87-89 = B+; 83-86 = B; 80-82 = B-; 77-79 = C+; 73-76 = C; 70-72 = C-; 64-69 = D+; 56-63 = D; 50-55 = D-. A practice exam will be handed out before each of the mid-terms exams but not for the final exam. We may go over these during recitation. They will give you some idea of the type of question to expect on exams.

The grades for Fall term of 1999 fell into this distribution: 25 A's; 19 B's; 21 C's; 8 D's; 2 F's; and 9 incompletes.

Students may wish to research specific topics in the genetics literature. A list of journals which contain genetics articles and access to genetics web sites appears on our web site. Your instructor is eager to assist you with this venture.

Study materials (texts)

The text is: Essential iGenetics by Peter Russell. Some materials within assigned readings will not be covered in the course. I suggest you use the lecture materials as a guide for deciding on which text materials are to be read thoroughly. Note the references, glossary and answers to select problems at the end of the text.

Copies of the Study Guide and Solutions Manual (answers to all text problem sets) are on reserve in the library. To keep the cost of the course at a minimum I have not had the bookstore order the Manual. It is not at all necessary for the course; however, if you find some of the materials useful you might just xerox select pages.

A Genetics Workbook is available for purchase at SmartCopy, 1915 SW 6th Ave and on reserve in the library. This is a compilation of simple exercises that I have found useful for learning specific areas of genetics. These exercises are exceedingly simplistic but do represent problem areas for some students. Some exercises may even insult your intelligence. Please let me know if this is the case! And, I would like to add any new exercises you might suggest or write.

Study materials (on the Web)

An outline is available for each lecture. This is the document I use for organizing and presenting my lectures. I prefer to keep it an outline rather than a set of lecture notes. As such, graphics and other specific items are listed as hypertext. Again, this is not a set of lecture notes!

On printing from the Web. It is not necessary to print all items; be selective; save paper! Most of the materials are in large format for presentation in this lecture hall. They may be printed at reduced scale.

A variety of animations, tutorials, graphics designed especially for this course may be accessed via the chapter outlines (http://www.irn.pdx.edu/~newmanl/ChapterOutlines/ChapterOutlines.html) and the graphics catalog (http://www.irn.pdx.edu/~newmanl/GraphicsCatalog.html).

Communicating with your instructor

Most questions will be answered during recitation time.

I am available before and after class for some questions. Sometimes I am super rushed before class in order to get the lecture set up and after class I am sometimes emotionally drained. So, my before and after class responses may not be what you would expect. We should all be relaxed during recitation time.

I like the idea of written questions. This forces you to think out the specific question and it gives me time to give a thoughtful written response.

You may put anonymous or signed questions in the basket or you may e-mail me questions.

Course questionnaires There will be two anonymous course questionnaires.
A Mid Course Correction form will be handed out after the return of the first exam. I would like to know how the course is going and ask for suggested changes. I really want to have this returned to me without delay. So, I will offer two points on the second exam if you return the form by the requested date. I do not mean to have this serve as a course evaluation. The course evaluation will be handed out during the last lecture of the term. You will have an opportunity to score my performance and make suggestions for the next time the course is given. Criticisms of the course and my responses will be posted on the Web.

Some study suggestions

Look at the Study Guide on reserve in the library and xerox appropriate items; make a list of words used in lecture, know how to use them; work out suggested text problems, check your answers

against the answers at the end of the text and in the Study Guide; work the exercises in the workbook, answers are in the workbook; follow the lectures using the list of specific items which appear below; organize your questions and ask them during recitation or via the basket or e-mail. I do not believe that any question is silly or too elementary to be asked. Organization of students into study groups is a good idea.

A book dealing with study methods: Klusky, J. I. 1992. Easy A's : winning the school game. Uptone Press.

Specific text items to be covered in each chapter

Chapter 1; Introduction/chromosomes

transmission/molecular/population genetics

eukaryotes/prokaryotes

chromosome anatomy, size, number, constrictions, telomere, cell cycle

details of mitosis and meiosis

gene segregation in mitosis and meiosis

Chapter 2; Mendelian Genetics

genotype/phenotype; use of term "partial" *

gene/environmental interactions

details of Mendel's experiments
- choice of organism
- seven character differences
- terminology
- Punnett Square
- results

segregation and independent assortment (table of ratios; in workbook)

fraction method of working problems for simple and complex problems

pedigree analysis

Chapter 3; Chromosome theory of inheritance

sex chromosomes

chromosome numbers

segregation and independent assortment of chromosomes

sex chromosomes

plus/letter system for genotypes

Morgan and sex-linkage

Morgan and chromosome theory; non-disjunction

segregation and independent assortment of chromosomes

sex determination in Drosophila

sex determination in mammals; x-chromosome inactivation; dosage compensation

autosomal linkage vrs. sex linkage
x-linked traits in humans

Chapter 4; Extension of Mendelian Analysis

multiple alleles

dominance relationships

modified Mendelian ratios/ non-allelic interactions

lethal genes

penetrance and expressivity
environmental effects
nature/nurture; norm of reaction

Chapter 5; Linkage

genetic markers

parental and recombinant progeny

principle of linkage: genes on a chromosome; new symbolism

concept of map distance; mapping function
cis/trans arrangements

inter and intrachromosomal recombination *

linkage maps; tomato and Drosophila

crossing-over and recombination

grandfather method in humans*

Chapter 21; Gene*/chromosomal mutations

gene and chromosomal mutations

forward and back mutations*

somatic/germinal; timing of mutations; types of mutations*

detection systems: Tradescantia*, ClB*

chromosome structure review

polytene chromosomes

chromosome mutation table

within chromosome mutations: deletion, duplication, inversion

between chromosome mutations: translocation

Robertsonian translocations

euploidy

aneuploidy

Chapter 8; DNA: Structure

transformation experiments

Hershey/Chase experiments

Watson/Crick model

Chapter 8; DNA: eukaryotic chromosomes

packaging of DNA into chromosome

euchromatin and heterochromatin again

sequence organization; gene families

C-value paradox

facultative and constitutive heterochromatin

centromeric DNA

Chapter 9; DNA replication

DNA replication; Meselson/Stahl experiments

chromosome replication; Harlequin chromosomes

some details of DNA replication
A. Kornberg experiments

Chapter 10; genetics and proteins

one gene one enzyme hypothesis; Garrod, Beadle and Tatum

enzyme mutations in humans

inborn errors of metabolism

protein structure

amino acid sequences; and gene mutations

protein function; human diseases

colinearity of gene and protein*

Chapter 11; transcription

RNA synthesis

initiation, elongation, termination

transcription in eukaryotes

eukaryotic mRNAs

production of mature eukaryotic RNA

transcription of other genes

Chapter 12; translation

chemical and molecular structure of proteins

nature of the genetic code

characteristics of the genetic code

process of protein synthesis

Chapter 6; fine structure of the gene

gene fine structure, Benzer

complementation
(beta globin as a model gene)

Chapter 13; Recombinant DNA

restriction enzymes

restriction maps

vectors

clones/libraries

blotting

nucleotide sequencing

PCR

Chapter 16; gene control in prokaryotes

lac operon

Chapter 17; Gene control in eukaryotes

gene control in eukaryotes

* = items not in the text

Bi 341 on the Internet **(note lowercase L in my name******)**

The URL of our Bi341 page is: http://www.irn.pdx.edu/~newmanl/Bi341.html

My e-mail address is: newmanl@pdx.edu

My web home page URL is: http://www.irn.pdx.edu/~newmanl/index.html