RUTGERS
NEWARK
Federated Department
of Biological Sciences

NJIT
New Jersey's Science &
Technology University

Course Syllabus/Spring 2014

120:352 Genetics

INSTRUCTOR:	Miguel Cervantes-Cervantes, Ph.D.	**CONTACT:**	miguelcc@andromeda.rutgers.edu Office hours posted next to Boyden 205
OFFICE:	Boyden 205.	**COURSE WEBSITE:**	Blackboard https://blackboard.newark.rutgers.edu/
COURSE LOCATION:	Boyden 100 (Wednesday, 8:00-9:20 A.M.), Lecture; Ackerson 106 (Friday, 10:00-11:20 A.M.), Problem-solving session		

COURSE DESCRIPTION:
The basic principles and mechanisms of transmission genetics. Sex-linked traits. The role of probability in genetics. Gene expression and regulation. Gene organization in the prokaryotic genophore and the eukaryotic chromosome. Genetics of model organisms. Use of mutants in genetic studies. Genomes, genomics, and the use of nucleic acids and protein databases. Epigenetics, extranuclear inheritance and cytoplasmic factors. Generalities of population, quantitative and evolutionary genetics.

Prerequisites: 21:120:201 and 21:120:202

REQUIRED TEXT:
Hartl DL, Ruvolo M (2012) Genetics: Analysis of Genes and Genomes, 8th Edn. Jones and Barttlet Publishers, Burlington, Mass. ISBN 978-1-4496-3596-1.
Students Solutions Manual and Supplemental Problems, ISBN 978-1-4496-4470-3.

GRADING POLICY:

Four Exams	25% Each
TOTAL	**100%**

GRADING

- There are four scheduled exams which will be held on the dates indicated above, three during class time and one during the finals week as per Rutgers University's final examination schedule.
- The format of the exam will be a mixture of multiple-choice, short-answer questions and problems assigned (or even solved) in class.
- *If* take-home problems are included as part of the class-time exam grades, percentage values will be assigned accordingly.
- Please notice that the fourth exam is semi-cumulative, meaning that it will cover chapters 14, 16 and 17 plus appplied concepts from chapters 1 to 13 of the Hartl and Jones text.
- Each exam grade will count for one-fourth of the course grade:

Exam 1	+	Exam 2	+	Exam 3	+	Exam 4	=	Final Grade
25%	+	25%	+	25%	+	25%	=	100%

- Percent scores are converted to letter grades as per university policy. “Grades represent the level of quality of the student's performance measured against standards of knowledge, skill, and understanding as evaluated by the instructor. Grades are reported to the university registrar at the end of each term by the following symbols:"

%	<59.49	59.5–69.49	69.5–74.49	75.5–79.49	79.5–84.49	84.5–89.49	89.5–100
Letter	**F**	**D**	**C**	**C+**	**B**	**B+**	**A**
Meaning	Failing	Poor	Satisfactory	Good	Excellent		Outstanding

- The lowest grade will not be dropped.
- There will be no make-up exams for missed tests, with the exception made for an officially approved reason (see university guidelines) for which you have written documentation (e.g., physician's note, religious reason, etc.). Please notify your instructor as soon as possible prior to the scheduled exam.
- Please note that, after grade submission to the Registrar, there will be no special assignments or other activities to improve your grade.
- Regarding score curving: No curve will be applied to exam grades. While this practice might benefit students with low scores, when properly done it does not help those with high marks. When asked if I curve you'll invariably get the same answer: "No. Do you really **know** what curving means?"
- Same goes with the "chapters" question. You have the text, you have the syllabus, you come to class. Please refrain from asking me "What chapters are going to be in the exam?" The idea is to learn, not just to cram for exams.
- Also, please see me during office hours, not after the class when I'm gathering my stuff from the podium. Thanks.
- Grade appeals should be addressed to me first, as per university policy.[1]

%	<59.5	60-69.5	70-74.5	75-79.5	80-84.5	85–89.5	>89.5
Letter	**F**	**D**	**C**	**C+**	**B**	**B+**	**A**
Meaning	Failing	Poor	Satisfactory		Good	Excellent	Outstanding

Academic Integrity Policy Enforcement

The course has a zero tolerance policy for academic dishonesty, including plagiarism and cheating. Instances of dishonesty will be punished by a zero on the assignment and consultation with the Academic Integrity Officers to determine if further action is required. If you have any questions about what constitutes plagiarism or cheating, please ask your instructors or refer to the academic integrity websites for Rutgers and NJIT:

- ✓ http://academicintegrity.rutgers.edu/academic-integrity-at-rutgers
- ✓ http://studentconduct.rutgers.edu/
- ✓ http://www.njit.edu/academics/integrity.php

Mission Statement:

This course has the general purpose of analyzing the functions and properties of genes across all domains of life, as well as to exposing students to current methods of genetic analysis, including genomic approaches, use of biological databases, molecular biology techniques, and the study of model organisms. Using the work of the ENCODE consortium as a background and the historical development of genetics, students will arrive to a definition of gene that is adequate to contemporary biological thought.

[1] http://catalogs.rutgers.edu/generated/nwk-ug_0608/pg23594.html

LEARNING OBJECTIVES:

At the end of the course, students will:

- describe experimental work utilized in unraveling the biochemical properties of genes and how they relate to the mechanisms of heredity.
- describe experimental evidence leading to determine polynucleotides as the genetic material.
- utilize statistical tools such as χ^2 to test the goodness of hypotheses in genetics, as well as Bayesian theorem in conditional probability analyses.
- learn to use genetic databases, including NCBIS's Online Mendelian Inheritance of Man.
- gain appreciation of the practice of genomics and molecular biological techniques, as well as their application in population genetics, pharmacogenetics and other fields.
- describe chromosomal aberrations and their causes; point mutations; maternal and other extranuclear inheritance processes; epigenesis and other factors modifying phenotype.
- describe the several types of recombination mechanisms and appreciate them as the basis for genetic diversity.
- arrive to a self-learned working definition of gene based on current scientific evidence and the work from the ENCODE Consortium.

TEACHING AND LEARNING MODELS:

Class meets twice a week. During the first session, a lecture-style presentation on the topic of hand will be given. Occasional self-evaluating quizzes will be applied. Materials for class will be based on the textbook, as well as on articles and handouts provided by the instructor.

The second session will be dedicated to problem solving. Problems are located at the end of the book's chapters. A solutions manual is available and it contains supplemental exercises. Problems will be culled from other sources, depending on the topics.

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SCHEDULE AND COURSE OUTLINE: Boyden 100 (Wednesday, 8:00-9:20 A.M.; lecture); Ackerson 106 (Friday, 10:00-11:20 A.M.; problem-solving session. Updates to the course contents will be regularly posted on Blackboard.

DATE	TOPIC	ASSIGMENTS (HARTL & RUVOLO)
Jan 23	Presentation of the course:	Chapter 1
Jan 25	Genes, genomes and their analysis	
Jan 30	DNA structure and genetic variation	Chapter 2
Feb 1, 6, 8	Mendelian genetics	Chapter 3
Feb 13	Chromosomes and sex-chromosome inheritance	Chapter 4
Feb 15	Genetic linkage and chromosome mapping	Chapter 5
Feb 20	**Exam 1 (Chapters 1–5)**	
Feb 22, 27	Molecular biology of DNA replication and recombination	Chapter 6
Mar 1	Molecular organization of chromosomes	Chapter 7
Mar 6	Human karyotypes and chromosome behavior	Chapter 8
Mar 8, 13	Genetics of bacteria and bacteriophages	Chapter 9
Mar 15	**Exam 2 (Chapters 6–9)**	
Mar 16–23	**Spring Break**	
Mar 27, 29	Gene Expression and its regulation	Chapter 10
Apr 3, 5	Molecular mechanisms of gene regulation	Chapter 11
Apr 10, 12	Genomic, proteomics and transgenics	Chapter 12
Apr 17, 19	Genetic control of development in higher organisms	Chapter 13
Apr 24	**Exam 3 (Chapters 10-13)**	
Apr 26	DNA Damage and repair	Chapter 14
May 1	Extracellular inheritance	Chapter 16
May 3	Molecular evolution and population genetics	Chapter 17
May 7, 8	**Reading Days**	
May 10	**Exam 4 (Chapters 14, 16, 17 + general concepts from 1-13)**. Please notice start time: 11:45 A.M.	