Loyola University Chicago: BIOL 282-Genetics
John Felice Rome Center
Spring 2024
Tuesday and Thursday | 5:15-6:30pm
Dr. Eugenio Sangiorgi
Email: esangiorgi@luc.edu
Office Hours: Tue. 4:15-5:15pm

Course Description:

Upon completion of this course, students will gain an understanding of the fundamental molecular processes governing DNA replication, transcription, and translation, as well as comprehension of the genetic code. Additionally, they will learn about Mendelian laws of inheritance that dictate the passage of genetic traits, the basic structure and function of DNA and chromosomes, and how chromosomes undergo mitosis and meiosis. The course will also cover the Hardy-Weinberg law, which describes genetic equilibrium in a population. Furthermore, we will explore essential aspects of cancer genetics in humans, along with the most recent techniques for sequencing entire DNA in an individual and the foundational principles of DNA sequence manipulation.

Learning Outcomes:

Genetics is a rapidly advancing field that intersects with various disciplines including medicine, biology, basic science, agriculture, and veterinary science. Its legal and ethical implications permeate nearly every aspect of daily life.
The primary objective of this course is to provide a solid foundation in genetic fundamentals by examining the basic principles of genetics in humans, with a specific emphasis on describing the main genetic mechanisms governing disease transmission. Consequently, students are expected to develop the skills necessary to comprehend inheritance laws, construct pedigrees, infer the most probable inheritance patterns, and assess the recurrence risk of specific genetic conditions. Students will also demonstrate proficiency in solving problems and quizzes related to these topics.
Students will learn how transcription, translation, and the genetic code facilitate the transfer of genetic information from DNA to proteins, and gain an understanding of gene expression regulation.
Additionally, students will be able to articulate the origins and genetic implications of mutations and chromosomal abnormalities. They will also analyze allele and genotype frequencies within populations, examining key processes in population genetics such as mutation, migration, natural selection, sexual selection, and genetic drift, and elucidate how these processes influence genetic diversity within the human species.
Students will evaluate the implications of somatic and germline mutations in the development of cancer, and identify optimal methods for detecting and analyzing variations at the gene, genome, and phenotypic levels within and between individuals, utilizing modern DNA analysis techniques.
Each class session will be divided into two parts. The first half will consist of a traditional lecture, while the second half, starting from the second week onward, will involve hands-on PC exercises focused on DNA sequence manipulation, genome browsing, and basic tasks related to DNA sequences. Weekly assignments aligned with the material covered in class will be assigned, and their evaluation will contribute to the final grades.

Required Text / Materials

Thompson & Thompson Genetics and Genomics in Medicine (Thompson and Thompson Genetics in Medicine) 9th Edition
Assigned readings and power point slides of each lecture will be posted on Sakai a few days before each class.

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Attendance Policy

In accordance with the JFRC mission to promote a higher level of academic rigor, all courses adhere to the following absence policy. Prompt attendance, preparation and active participation in course discussions are expected from every student.

- For all classes meeting once a week, students cannot incur more than one unexcused absence.
- For all classes meeting twice a week, students cannot incur more than two unexcused absences.
- For all classes meeting three times a week, students cannot incur more than two unexcused absences.

This course meets once a week, thus a total of 1 unexcused absence will be permitted. **Unexcused absences beyond these will result in 1% lowering of the final course grade, for every absence after the "approved limit".**

The collective health of the JFRC is everyone's responsibility. DO NOT ATTEND CLASS IF YOU ARE ILL.

Assessment Components

- Midterm Exam 40%
- Assignments 20%
- Final Exam 40%

Grading There will be one non-cumulative exam (midterm) and a second one during final exam week. The exams will consist of multiple choice-type questions, problems and short open questions. Each week starting from the third week of classes, there will be also assignments (in the form of homework, with the students having to use software to manipulate the DNA sequences and search the genome browser or other DNA databases). The evaluation of these assignments will be added to the evaluation of the midterm and the final exam.

My expectations are that the following grade cut-off will apply

Grade	Cut off		
A	94-100%	4.00	Excellent
A-	90-93%	3.67	
B+	87-89%	3.33	
B	84-86%	3.00	Good
B-	80-83%	2.67	
C+	77-79%	2.33	
C	74-76%	2.00	
C-	70-73%	1.67	
No passing grades			
D+	67-69%	1.33	
D	60-66%	1.00	Poor
F	0-59%	0.00	Failure

Academic Honesty

Plagiarism and other forms of academic dishonesty are unacceptable at the JFRC and will be dealt with in accordance with Loyola University Chicago's guidelines. Please familiarize yourself with Loyola's standards here. You are responsible to comply with the LUC Student Handbook.

Accessibility Accommodations

Students registered with the Student Accessibility Center requiring academic accommodations should contact the Office of the Dean at the John Felice Rome Center, the first week of classes.

Course Schedule

	DATE	LECTURE	Book chapter*
Week 1	January 16 & 18	Welcome and introduction to Genetics, Meiosis	1,2
		Gene structure and the Genetic Code	3
Week 2	January 23 & 25	Transcription Translation	3
		Classes of mutations	4
Week 3	January 30	DNA synthesis	
	February 1	Fragile X as model disease	8
Week 4	February 6 & 8	General concepts about Mendelian inheritance	7
			7
Week 5	February 13 & 15	Autosomal and X linked inheritance	7
			7
Week 6	February 20 & 22	Exercises on pedigrees with autosomal\X-linked transmission	17
		Recurrence risk evaluation of autosomal recessive\X-linked conditions	
Week 7	February 27	Study session	
	February 29	Midterm exam	
Week 8	March 12 & 14	Linkage analysis	11
Week 9	March 19 & 21	Chromosomal structural abnormalities	6
		Chromosomal numerical abnormalities	6
Week 10	March 26 & 28	Techniques of chromosomal analysis	6
Week 11	April 2 & 4	Cancer genetics	16
Week 12	April 9 & 11	Hardy-Weinberg equilibrium	
		Study session with exam simulation exercises	
Week 13	April 16 & 18	Factors modifying the Hardy-Weinberg equilibrium	
		Study session with exam simulation exercises	17
Week 14	April 22 - 26	Final exam	

*Book chapter refers to Thompson & Thompson Genetics and Genomics in Medicine (Thompson and Thompson Genetics in Medicine) 9th Edition