

BIOL3010 Molecular Genetics, Spring 2017

Lectures: 12.30PM to 1.45PM Tuesdays and Thursdays BO1059

Instructor: Dr. Malathi Krishnamurthy

Office: Wolfe Hall 3213B

Phone: 530-2135

e-mail: Malathi.Krishnamurthy@utoledo.edu

Office Hours: Tuesday and Thursday 2.00PM to 3.00PM

Course Web Site:

Molecular Genetics is a Web-Assisted Course:

Figures and important information for each lecture will be posted on the Blackboard course web site (we will be using Blackboard 9.1) as PPT slides at least one day before the lecture. These notes can be printed out ahead of lecture and used to help you take notes during the lecture. Clickers have to be registered for this course. **Please note that important information will be given during lecture that is not included in the posted notes, thus it is important for you to attend each lecture and take notes during class time in order to do well in this course.**

You may contact me by email, I check my messages and will reply promptly to any questions/concerns you may have.

Required Text:

Essentials of Genetics, 9th Edition (Klug and Cummings) (ISBN-13 978-0-134-04779-9)
Prentice Hall, New Jersey (2016)

Purchase of the textbook also includes free access to Geneticsplace.com

A Study guide and Solutions Manual (Harry Nickla) (ISBN# 978-0-134-189987) is also available. You are not required to purchase this book but it may be helpful if you want additional problems to work through.

Important Dates:

T 1/31 1st Exam 18% of final grade (On lectures 1/10 to 1/26)(13% for Hons students)

T 2/7 Honors students get topic approved.

R 2/23 2nd Exam 18% of final grade(On lectures 2/2 to 2/21)(13% for Hons students)

T 4/4 3rd Exam 18% of final grade (On lectures 2/28 to 3/30) (13% for Hons students)

R 4/13 Honors essay due (15% of grade)

T 5/2 Final Exam 12.30-2.30PM – cumulative 40%

Clickers responses in the course 6% of final grade.

Learning Outcomes of BIOL3010:

BIOL 3010 is a 3 credit hour lecture course. Through this course you will:

- 1) Become familiar with the fundamental concepts underlying modern molecular genetics such as the properties of nucleic acids, mechanisms of DNA synthesis, replication and repair, and sources of DNA variation.
- 2) Gain a greater understanding of the multiple levels of gene expression including regulation of transcription and post-transcriptional regulation, and protein synthesis (translation).
- 3) Provide you with an introduction to the role of genetics in human diseases as well as the practical application of modern molecular genetics in our society.

Course Policy on Absences:

Students are expected to attend all lectures. Clicker response questions will be used throughout the lectures and account for 6% of the final grade. Students missing the lectures and points for clickers will not be compensated, unless absence is for medical reasons (need proof, see below) or emergency. Students are responsible to ensure the clickers are in working condition.

Students who wish to withdraw from the course are responsible for withdrawing by the specified deadline. If you remain registered for the course past the deadline you can only receive a letter grade for the course (A-F). I will only give an Incomplete (I) grade in extenuating circumstances and you must consult with me prior to me giving you an Incomplete grade.

In the event of an unanticipated absence at an exam due to illness or emergency, evidence of the necessity of the absence must be provided in the form of a doctor's letter or equivalent. Any unaccounted absence will result in no points awarded for that exam and thus greatly threatens your chances of success in the course.

For anyone that has substantiated to me that they had to miss an exam due to illness or emergency, I will work with them to schedule a makeup exam. The format of the makeup exam will be up to my discretion and will likely consist of short answer/ essay style questions. **Makeup exams will only be considered where INDEPENDENT proof of the necessity of the absence is presented.**

Student Evaluation:

There will be three in class exams during the semester and a comprehensive final exam.

The in class exams will consist of approximately 50 multiple-choice questions including problem solving and data interpretation. These exams will only cover new material (i.e.-material covered since the previous exam)

The final exam will be comprehensive and will likely consist of approximately 75 to 100 multiple-choice questions. About 50% of the final exam will cover topics discussed since the third exam. The remaining 50% will cover topics discussed from the start of the semester.

Any student arriving more than 15 minutes late for an exam **or** after any student has completed the exam and left the room (which ever comes first) will not be allowed to take the exam.

Bring 2-3 sharpened number 2 pencils with good erasers to the exam. **Please bring your ID card and your R# along.**

If an exam is missed, the instructor must be notified within 48 hours and documentation of the reason for missing the exam must be provided. Acceptable excuses include a death in the immediate family and documented illness of the student.

Make-up exams will be given at the discretion of the instructor and will consist primarily of short answer/essay type questions. Because of this, it is likely that make-up exams will be more difficult than the exam taken in class. In addition, make-up exams will be administered in the university test center and I will not be available to answer questions that may arise during the exam.

Exams will be based on materials from lectures, review problems and assigned textbook readings, however material covered in the lectures will be emphasized so students should attend class and take detailed notes. The instructor will not provide lecture notes, so if you miss a class make sure to get notes from other students. There will not be any set number of questions per lecture; some lectures may include 5 or 6 questions whereas others may only have 1 or 2. Clicker responses in class will account for 6% of your final grade. The instructor will not compensate for malfunctioning clickers.

Students will have one week after grades are posted to review their exams. Exams will not be available beyond this date to review.

This course will be taught at the level of above average learners. To perform well, you need to review the material before and after the lecture and attend lectures.

Grading of BIOL3010

The breakdown of marks is shown below:

T 1/31 1st Exam 18% of final grade (On lectures 1/10 to 1/26)(13% for Hons students)
T 2/7 Honors students get topic approved.
R 2/23 2nd Exam 18% of final grade(On lectures 2/2 to 2/21)(13% for Hons students)
T 4/4 3rd Exam 18% of final grade (On lectures 2/28 to 3/30) (13% for Hons students)
R 4/13 Honors essay due (15% of grade)
T 5/2 Final Exam 12.30-2.30PM – cumulative 40%
Clickers responses in the course 6% of final grade.

GRADING SCALE:

Grade equivalents will be assigned as follows: This scale is based on the assumption that knowledge of 50% of the material is needed to pass this course.

% of available marks	Grade	Standard
92-100	A	Achievement of outstanding quality
89-91	A-	Achievement of slightly less than outstanding quality
85-88	B+	Achievement of slightly more than high quality
78-84	B	Achievement of high quality
75-77	B-	Achievement of slightly less than high quality
71-74	C+	Work of slightly more than acceptable quality
64-70	C	Work of acceptable quality
61-63	C-	Work of slightly less than acceptable quality
57-60	D+	Work slightly above the quality expected
52-58	D	Work below the quality expected
50-51	D-	Work slightly below the quality expected

Course Policy on Cheating:

Everybody in this course is capable of earning a passing grade without the need to cheat. Any student caught cheating will be given a grade of zero for that exam/assignment and all available information on the incident will be forwarded to the Dean of Student Affairs for investigation and appropriate action.

ANTICIPATED LECTURE SCHEDULE FOR SPRING 2016

The actual topics that we cover on given days are subject to change depending on the rate of progress.

Lecture/Date:	Topic:
1: T 1/10	Course orientation and Introductory Lecture (Read Chap. 1 & 2)
2: R 1/12	Mendelian Genetics, (Chap. 3)
3: T 1/17	Modification of Mendelian Ratios (Chap. 4)
4: R 1/19	Mutation in Bacteria, Conjugation Mapping (Chap 8)
5: T 1/24	Mutation in Bacteriophage and Transduction Mapping (Chap. 8)
6: R 1/26	Gene Mapping in Eukaryotes, Recombination (Chap. 7)
T 1/31	1st Exam 18% of final grade (On lectures 1/10 to 1/26)
7: R 2/2	Nature of Genetic Material-DNA and RNA (Chap. 9)
8: T 2/7	DNA Structure, DNA Replication I (Chap. 9 & 10)
9: R 2/9	DNA Replication II (Chap. 10)
10: T 2/14	Chromosome Structure and Organization (Chap. 11)
11: R 2/16	Gene Mutation and DNA Repair I (Chap 14)
12: T 2/21	Gene Mutation and DNA Repair II (Chap 14)
R 2/23	2nd Exam 18% of final grade (On lectures 2/2 to 2/21)

13: T 2/28	The Genetic Code, Transcription I (Chap. 12)
14: R 3/2	Transcription II (Chap. 12)
T 3/7 R 3/9	NO CLASS SPRING BREAK
15: T 3/14	Translation I (Chap. 13)
16: R 3/16	Translation II (Chap. 13)
17: T 3/21	Gene Regulation in Prokaryotes I-The Lac Operon (Chap. 15)
18: R 3/23	Gene Regulation in Prokaryotes II-Attenuation (Chap. 15)
19: T 3/28	Gene Regulation in Eukaryotes (Chap. 15, spl topics 1 Epigenetics)
20: R 3/30	Developmental Genetics (Chap. 20)
T 4/4	3rd Exam 18% of final grade (On lectures 2/28 to 3/30)
21: R 4/6	Recombinant DNA Technology (Chap. 17)
22: T 4/11	Recombinant DNA Technology (Chap 17)
23: R 4/13	Genomics and Proteomics (Chap 18)
4/13	ESSAY ON GENETICS IN SOCIETY DUE
24: T 4/18	Genetic Engineering (Chap. 19, spl topics 3 DNA forensics)
25: R 4/20	Genetic Basis of Cancer/Cell cycle control (Chap. 16)
26: T 4/25	Genetic Basis of Cancer/Cell cycle control (Chap. 16, ST1 Epigenetics)
27: R 4/27	Special topics Genomics and Personalized medicine, Stem cells.
T 5/2	12.30 to 2.30PM. Final Exam 40% of final grade (about 50% on lectures from 4/6 to 4/27 and the other 50% from the entire course)

Honors students see grading and requirements at the end.

STATEMENT OF ACADEMIC DISHONESTY

Department of Biological Sciences

Academic dishonesty by students enrolled in undergraduate and graduate courses and programs offered by the Department of Biological Sciences will not be tolerated. Academic dishonesty includes but is not limited to:

1. Obtaining assistance from another individual during an examination.
2. Giving assistance to another individual during an examination.
3. The unauthorized use of study material or textbooks during an examination.
4. Changing answers on an examination after it has been returned and then submitting it for regrading.
5. Plagiarizing written assignments. Plagiarizing includes but is not limited to : a) Copying laboratory reports from previous years, b) copying or paraphrasing reports, term papers, or these prepared by other students, c) unauthorized collaboration in the preparation of reports, term papers, or theses, and d) use of another author's materials without appropriate acknowledgement through quotation and citation.

6. Attempting to bribe or otherwise induce an instructor to alter either a grade or examination score.
7. Obtaining or attempting to obtain a copy of an examination prior to its administration.

In accordance with policies presented in The Student Handbook and The University Catalog, Instructors have the responsibility and right to report cases of alleged dishonesty to departmental, college, and university administrative units. Students involved in academic dishonesty may expect to receive a grade of F on specific assignments as well as in the course where the assignment was made. In addition, disciplinary action may be recommended through appropriate college and university disciplinary committees. Please consult your instructor for instructions on the implementation of this policy.

BIOL3010: Molecular Genetics

Honors Section

Spring 2017

Students enrolled in the Honors section of Molecular Genetics are required to write a research paper on a topic of your choice that is related to the field of molecular genetics. Your topic must be approved by Dr. Krishnamurthy. The Honors student assignment is designed to make you probe deeper into the use of the knowledge gained in BIOL 3010 by applying that knowledge to a specific gene from humans. The main goal is to write a report of up to 12 pages (single spaced) in which you look at a given gene from many genetic viewpoints. Figures relevant to your topic should be included are included in the 12 pages. Here is a breakdown of the assignment.

Reports will be due on April 13th and will be worth 15% of your overall grade

1: Pick a human gene from Online Mendelian Inheritance in Man (OMIM)

When you search using the OMIM search engine <http://www.ncbi.nlm.nih.gov/omim> you should look for a gene with known sequence and phenotype by checking the box in OMIM Number prefix <http://www.ncbi.nlm.nih.gov/omim?TabCmd=Limits>

OMIM Limits

Search OMIM for cancer

Limits Preview/Index History Clipboard Details

- To Search all fields, leave the following boxes unchecked.
- To narrow the search, check the boxes with specific fields' names, or use [search field tags](#) enclosed in square brackets, e.g. aaa[title].
- [Boolean operators](#) AND, OR, NOT must be in upper case.

Search in Field(s): clear <input type="checkbox"/> Title <input type="checkbox"/> MIM number <input type="checkbox"/> Allelic Variants <input type="checkbox"/> Text <input type="checkbox"/> References <input type="checkbox"/> Clinical Synopsis <input type="checkbox"/> Gene Map Disorder <input type="checkbox"/> Contributors	MIM Number Prefix: clear <input type="checkbox"/> * gene with known sequence <input checked="" type="checkbox"/> + gene with known sequence and phenotype <input type="checkbox"/> # phenotype description, molecular basis known <input type="checkbox"/> % mendelian phenotype or locus, molecular basis unknown <input type="checkbox"/> none other, mainly phenotypes with suspected mendelian basis
Chromosome(s): clear <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 <input type="checkbox"/> 13 <input type="checkbox"/> 14 <input type="checkbox"/> 15 <input type="checkbox"/> 16 <input type="checkbox"/> 17 <input type="checkbox"/> 18 <input type="checkbox"/> 19 <input type="checkbox"/> 20 <input type="checkbox"/> 21 <input type="checkbox"/> 22 <input type="checkbox"/> X <input type="checkbox"/> Y <input type="checkbox"/> mitochondrial <input type="checkbox"/> unknown	Only Records with: clear <input type="checkbox"/> Allelic Variants <input type="checkbox"/> Clinical Synopsis <input type="checkbox"/> Gene map locus

Creation Date From: [] [] [] To: [] [] []
 Last Modification From: [] [] [] To: [] [] []
 Use the format YYYY/MM/DD; month and day are optional.

2: Check with me to make sure no-one else has chosen the gene you are going to work on. If you cannot decide on a gene then I will assign genes on a first come first served basis. **You should have chosen a gene and cleared with me no later than Feb 7th.**

3: Start researching the gene. Your report will be comprehensive and comment on many aspects of the gene such as those listed below. You should try to examine the gene from the view of most chapters that we cover in the book (some chapters may not be entirely relevant to the gene you choose).

Here are examples of questions that you can explore and the answers will help build your “gene report”

The gene report should have a title and 150 word abstract at the beginning and be divided into the following sections. A proper bibliography and citations should be provided (also not included in 12 pages).

a: Gene Function: the function of the gene/protein in the cell, what is the normal protein size? what is the gene structure? In which tissues or time in development is this gene expressed or thought to function?

b: Phenotype: phenotypic traits (such as disease) that are associated with mutations in this gene

c: Variation: known variants – how are mutations in this gene inherited? Simple recessive? Dominant? non-Mendelian fashion? If there are several mutations of this gene, pick a few of them and describe in detail the study of these mutations and what they may tell us about the normal function of the protein.

d: Gene Regulation: how is this gene regulated? Is it on in all cells or only some? Is it turned on or off by cellular or environmental signals (e.g DNA damage for a DNA repair protein)

e: Developmental Effects: is there a developmental phenotype associated with this gene? if so what is it? Mutations in some genes have surprising phenotypes e.g. mutation of a DNA helicase in humans leads to premature aging (Werner’s syndrome).

f: Gene Evolution: is this gene/protein conserved outside of humans? (most likely it is) how well conserved is this gene? is it conserved in lower animals, fungi, plants bacteria? What does the gene do in those organisms? Has it been studied in other model organisms? If so what insights have been gained from such studies? Does the gene have evolutionary significance in the distinction of humans from other primates?

g: Population studies. Are there different alleles of this gene? are there studies on the frequency of the different alleles in different human populations?

h: Application: if the gene has a medical relevance, have there been attempts to use it in gene therapy? Would this even make sense for this gene? if so or if not why?

i: Link to Behavior (optional) is this gene linked to behavior? How? What are the social consequences of the study of this gene?

j: Environmental Links (optional) Does this gene have ecological or environmental significance? If so what is it? Can the gene be used to monitor or assess genetic diversity?

Points to remember

1. The papers must be a minimum of 10 pages (12 point font, 1 ½ line spacing, with 1” margins on the top and bottom and 1.25” left and right margins) and a maximum of 12 pages (excluding your reference page).
2. Figures and diagrams may be used but must be appropriately referenced.
3. Write the report in your own words (i.e.- do not use direct quotes) but be sure to reference all information you take from other sources even when written in your own words.
4. Break up your paper into three main sections:
 - a. Introduction – What is the topic and why is it interesting/important
 - b. Main Body – Describe the topic in such a way that someone who was unaware of previously would be able to understand what it is about. This section will make up most of the paper.
 - c. Conclusion – Why was the topic important and what does the future hold for that topic
5. Reference Sources – You may use a variety of sources for information including: Articles from the lay press (news papers, news magazines, internet sources, etc.); Articles from scientific journals (either original published data or review articles); and books. Articles from the lay press are a good starting point for a topic that would be of general interest to the public but you are required to use articles from scientific journals.

Assessment:

This paper will account for 15% of your final grade (Each in-class exam will count as shown in the syllabus for 13% of your grade, clickers will be 6% of your grade). Final exams will account for 40% of the grade.

Your paper will be graded based primarily on the content and your demonstration of an understanding of the material. Papers that are not of the appropriate length and that do not have proper spelling and grammar will be reflected in a lower grade.