

Molecular Genetics

MCB6937 Syllabus 2018

Course/Section Information: MCB69372 Spring 2018-sections 1171 and 1D96

Course Prerequisites: BSC 2010 and BSC 2010L, or equivalent, with minimum grades of C.

Instructors: Dr. William Gurley (Department of Microbiology & Cell Science)

Textbook: Lewin's Genes or XI or XII, (strongly recommended, but not required), Authors: Krebs, Goldstein and Kilpatrick

Introduction: This course will discuss the synthesis and manipulation of DNA and the principles of gene expression at the molecular level in both prokaryotes and eukaryotes. The topics covered will include an introduction to the concepts of DNA replication, repair and packaging of the genome into chromosomes. In preparation for this course, you should have an understanding of basic college level introductory biology and it is recommended to have at least one other more specialized biology course such as Microbiology, Botany, Zoology, Genetics or Biochemistry.

Student Learning Goals:

The goal of PCB4522 (Molecular Genetics) is for participants to understand the roles of DNA and RNA in both prokaryotes (eubacteria and Archaea) and eukaryotes, including yeast, plants, drosophila and man. *Students will:*

1. Develop an appreciation of the organization and evolution of living systems and the role of genetic mutation and selection in the evolution of the human species.
2. Acquire knowledge regarding DNA replication in bacteria, plasmids, transposable elements, as well as eukaryotic organelles and the nucleus.
3. Become familiar with the molecular events involved in DNA repair and recombination.
4. Acquire a *detailed* understanding of the molecular mechanisms related to gene expression at the transcriptional level, with an emphasis on eukaryotes.
5. Learn to extract information from genomic databases and perform DNA sequence analyses using online bioinformatics tools.

Presentation Format: This course will be a hybrid between an online course and a traditional lecture style course. The goal is to have **all lecture material recorded live each lecture** and posted here at the Canvas website or at Vimeo.com. There will be approximately 3 hours of recorded lecture material available each week.

Attendance: optional though encouraged; web and distance students may also attend as seating permits. The class meets on Tuesdays period 7 (1:55-2:45 pm) and Thursdays periods 7-8 (1:55-3:50 pm). A 5 min stretch break will be given on Thursdays at 3 pm.

Office hours: Fridays 4-6+ pm

Email the instructor for an appointment time. Campus and local students are welcome to drop by my office (room 1152, MCS Building) for meetings on Friday afternoons. Distance students can meet using the Canvas Conference feature.

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Honor Code violations: Exams 1, 2, 3, 4, and the Optional Final are closed book and no outside material may be used during the exam including web-based and printed materials. Communication with persons not involved in proctoring is also prohibited during the exam. Failure to comply will result in a failing grade for the course.

Computer requirement:

All exams will be administered through **ProctorU** using Canvas in E-learning with students using personal computers. The exam may be taken at any location approved by ProctorU during the regularly scheduled course times. All students (campus and distance) will be given at least a 48 hr window to take the exams.

The major exams can only be taken at the listed times (below) unless special arrangements are made prior to the exam with the instructor.

All exams will be proctored with using ProctorU. The use of multiple devices to take exams and attempts to Screen Print during exams is strictly forbidden and will be prosecuted as Honor Code violations. Anyone not able to meet the above laptop computer requirements should contact the instructor as soon as possible.

ProctorU requirements: In an effort to enhance the integrity of the assessment process, USB external cameras will be required for all distance-proctored exams. A goose-neck model works best and may be acquired for around \$50. Students not seeking financial hardship assistance should contact the instructor before the first exam.

Spring 2018 Exam Calendar:

Exam 1	Jan 20-22	(6 hr of material)	(13.84% of grade)	ProctorU
Exam 2	Feb 17-19	(10 hr of material)	(23.08% of grade)	ProctorU
Exam 3	Mar 17-19	(11 hr of material)	(25.39% of grade)	ProctorU
Exam 4	Apr 14-16	(12 hr of material)	(27.69% of grade)	ProctorU
(Total from Exams + 90%)				

Homework quizzes (2% of grade) online submission; multiple attempts allowed

Gene structure/bioinformatics (3% of grade) online submission

Genome engineering project (5% of grade) online submission

Note: You may substitute the Final (retake exam) for the regular exam having the lowest score. However, if the score on the Final (re-take exam) is lower than your original grade, the original grade will stand.

Grading Policies:

4 Major Exams: 95 points.

There will be four major exams plus an **optional** Final exam. **The Final is actually just a re-take of your lowest exam.** The questions will be drawn from 15-18 questions banks per exam (40 multiple choice and fill-in-the-blank), so no two exams or re-takes are the same. *Note:* the exams are not of equal weight. Exam 1 is worth only ~50% of Exam 4. The exam weights are proportional to the number of lecture hours of material covered.

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Homework assessments: 2.0 points.

A perfect score will equal 2.0 points on all homework assessments. Homework assessments are open book exercises to encourage you to read the lecture material before or during the week the topic is covered in lecture. The best way to use the Homework quizzes is to take them multiple times to uncover all the questions. Use them to study using **no notes** to identify gaps in your knowledge.

Gene Structure/Bioinformatics Project: 3 points. This will begin after Exam 1. You will be assigned an unknown cDNA and expected to identify the gene and organism. In addition, you will learn how to conduct a multiple sequence alignment using web-based tools

The optional Genome Engineering Project will have multiple parts with the total points to equal 5.00 towards the final course grade as extra credit.

There will be no grade curve. (36% of the class has earned an “A” for the last 3 years.)

Grading Scale Numerical Equivalents	
A = 91 or above	C = 68-73.99(minimum needed for major)
A- = 89-90.99	C- = 65-67.99
B+ = 85-88.99	D+ = 62-64.99
B = 81-84.99	D = 58-61.99
B- = 79-80.99	D- = 54-57.99
C+ = 74-78.99	E = 0-53.99

UF Grading Policies:

<http://www.registrar.ufl.edu/catalog1011/policies/regulationgrades.html>

Schedule of lecture topics:

(*Note:* This schedule is only approximate and will vary according to the amount of material covered in class between Exams.)

Quick Guide to lecture topics:

Module 1:

- Evolution of early man: culture as phenotype?
- Replication of the genome (bacteria & eukaryotes)
- Extrachromosomal replicons (plasmids, mitochondria)
- Agrobacterium tumor-inducing plasmid
- Bacterial cell cycle and ColE1 replication mechanism

Module2:

- DNA replication details of mechanism and proteins involved
- Recombination in bacteria and eukaryotes
- DNA-based Transposons in bacteria
- Eukaryotic Transposons (DNA-based)
- Retrotransposons and Retroviruses (eukaryotes)

Module 3:

- DNA repair systems (bacterial and eukaryotic)
- Bacterial Transcription

promoters, RNA polymerase structure, sigma structure,
termination, rho

The Operon (basic concepts, CAP regulation, Lac, Ara and Trp)

Module 4:

Chromosomes

Histones and nucleosomes

Eukaryotic Transcription

Gene structure and promoters

Basal factors: TFIID, TFIIF, TFIIB, Mediator, preinitiation complex

Eukaryotic transcriptional regulation

DNA binding domains, steroid receptors, activators & repressors

Plant transcription

Epigenetics

RNA-based silencing, X-chromosome inactivation, transcriptional
memory, silencing of ancient transposons

Exam 1 Text Material

Genes XI

Chapter 11 (The Replicon)

Chapter 12 (Extrachromosomal replicons)

Parts of Chapter 13 (Bacterial replication connected to cell cycle) as follows:

Introduction

-----*Genes XI*-----

Exam 2 Text Material

Genes X (current text) Chapter

14 (DNA Replication)

Sections 14.1-14.16 (skip 14.15)

Chapter 15 (Homologous and site-specific recombination)

Sections 15.1-15.14

Chapter 17 (Transposable elements and retroviruses)

Sections 17.1-17.20, skip 17.17 (revised 14Feb2011)

Exam 3 Text Material (subject to revision; check Announcements)

Genes X (current text)

Chapter 16 Repair Systems (all sections)

Chapter 19 Prokaryotic Transcription

Chapter 26 The Operon (all sections except 26.15)

-----*Earlier editions:*-----

Genes IX

Chapter 20 Repair (all sections)

Chapter 11 Transcription (all sections)

chapter 12 The Operon (sections 12.1 through 12.21)

Chapter 28 Chromosomes (all sections except skip 28.8)

2018 Spring Break (March 3rd through March 10th)

Exam 4 Text Material (subject to revision; check Announcements)

Genes X (current text)

Chapter 9 Chromosomes (all sections except 9.8)

Chapter 10 Chromatin (sections 10.1-10.8; 10.10)

Chapter 20 Eukaryotic Transcription (all sections)

Transcription Factors (PowerPoint slides)

Earlier editions:

Genes IX chapter 29 Nucleosomes

sections:

29.1 through 29.4

29.7 through 29.9

29.11 through 29.13

Genes VIII chapter 20 Nucleosomes

sections:

20.1 through 20.4

20.7 through 20.10 (skip 20.9)

20.12 through 20.13

Genes IX chapter 24 Promoters and Enhancers

Sections:

24.1 through 24.20 (all sections)

Notes:

1) For the last lecture section (Activating Transcription), the exam questions will all come from the lecture notes. The textbook is still relevant, but only as a resource if there are topics in the slides that are unclear.

2) The topic selection for lecture is subject to change at the instructor discretion. Students will be given advance notice of changes to accommodate their study and exam preparation.

Policy regarding letters of recommendation 2018

The Department of Microbiology & Cell Science policy on letters of recommendation advises instructors not to provide letters in classes of 50 or more students due to the impossibility of providing meaningful evaluations.

Unfortunately, due to the large number of students enrolled in this course (180), I will not be able to provide letters of recommendation. This is a reversal of my past policy where letters were usually provided upon request. The demand for spring 2009 (PCB4522) was for 78 letters. Each letter was allotted a 30 min interview where I tried to assess qualities such as leadership,

motivation, integrity, research potential, teaching potential, intelligence, analytical and written communication skills, and appropriate dress. This is not possible based solely on student performance on 5 multiple choice exams. In order to truly evaluate each of the 78 students for whom I provided letters, it was clear that I needed a full time staff of investigators, counselors and psychologists. Needless to say, the Department was unable to furnish me with the staff required.

Class Attendance

For on-campus students, attendance is encouraged, but not required. All instructional materials will be provided online including video recordings of all lectures. Live lectures will be given each class period. UF class attendance policies:

<http://www.registrar.ufl.edu/catalog1011/policies/regulationattendance.html>.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Counseling and Wellness Center

Resources are available on campus for students having personal problems or lacking clear career and academic goals, which interfere with their academic performance. These resources include:

1. University Counseling Center, 301 Peabody Hall, 392-1575, <http://www.counseling.ufl.edu/cwc/Default.aspx> - personal and career counseling;
2. Student Mental Health, Student Health Care Center, 392-1171, personal counseling;
3. Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161, sexual assault counseling;
4. Career Resource Center, Reitz Union, 392-1601, www.crc.ufl.edu career development assistance and counseling.

For **emergencies** call the University of Florida Police Department: 392-1111 or 9-1-1 for emergencies.

Communication Methods for Online Students

Recommended for the syllabus of a course that delivers 80% or more of its content online is a statement that clearly outlines preferred methods for private and public communication regarding the course and for resolving technical issues the student may face.

Student Complaint Process: The following is recommended for inclusion in the syllabus to inform students on the process of filing a complaint about the course:

- *Residential Course:* https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

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- **Online Course:** <http://www.distance.ufl.edu/student-complaint-process>.

Please review this policy to ensure that your syllabus is in compliance, and just as a reminder, your syllabus must be posted on publicly accessible UF web sites per the August 26, 2013 Memorandum available at <https://administrativememo.ufl.edu/2013/08/posting-course-syllabi/>.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>. **Access to Exam 4 will require that the student complete the Instructor online evaluation.**

Class Demeanor

Students are expected to arrive to class on time and behave in a manner that is respectful to the instructor and to fellow students. Please avoid the use of cell phones and restrict eating to outside of the classroom. Opinions held by other students should be respected in discussion, and conversations that do not contribute to the discussion should be held at minimum, if at all.

NETIQUETTE GUIDE FOR ONLINE COURSES

It is important to recognize that the online classroom is in fact a classroom, and certain behaviors are expected when you communicate with both your peers and your instructors. These guidelines for online behavior and interaction are known as netiquette.

<http://teach.ufl.edu/wp-content/uploads/2012/08/NetiquetteGuideforOnlineCourses.pdf>

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Materials and Supplies Fees

There are no additional fees for this course.

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Microsoft Software for UF students

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<http://www.software.ufl.edu/>

The Office of Information Technology has great news for University of Florida students! If you want to upgrade your operating system or need Microsoft Office Suite, this media will be available in the Spring 2011 semester. The different media available are: Windows 7 operating system Upgrade, Microsoft Office Professional Plus 2010 (32-bit/64-bit) for PC or Microsoft Office for Mac 2011.

Software is free for UF students.

To check for availability of the media and technical requirements, contact the UF Computing Help Desk at (352)392-HELP(4357). Once the media is available, you can get it at the UF Computing Help Desk or at the UF Bookstore.

Campus Resources Summary:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392- 1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc/Default.aspx>, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department, 392-1111 (or 9-1-1 for emergencies).

<http://www.police.ufl.edu/>

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <http://www.crc.ufl.edu/>

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.