Bio115

Summer, 2014

Lectures: M/W/F, 9-12, Thimann 3

Discussion Section: Thur. 9-11, PSB 114

Instructor: Grant Hartzog, professor of MCD Biology.
Office hours: Tuesday, 3-5, Sinsheimer 349

Course Website: http://courses.pbsci.ucsc.edu/mcdb/bio115/

I will try to post slides on the night before each lecture so that you can print them out and take notes during class.

Podcasts: Podcasts of lectures will be available at https://webcast.ucsc.edu

Course Text: There is no required text for this class, however it is highly recommended that you use a text to supplement lectures. The recommended text book is available in Baytree Bookstore: *Molecular Biology of the Gene*, by Watson et al., 7th Ed. The Watson textbook gives a clear conceptual, but cartoonish presentation of the material. If you are looking for a used book, the 6th edition of the textbook is acceptable as well.

If you want a more data-driven approach to the course material, you might try Molecular Biology, by Robert Weaver (4th or 5th Ed.). This book uses a "how do we know" approach, showing much primary data and going into many experimental details. Sometimes however, the big picture is lost in all the details. Graduate school bound students are more likely to appreciate Weaver's approach. A third option is Molecular Biology: Genes to Proteins, by Burton Tropp (3rd or 4th Ed.). I am less familiar with this book, but other faculty who teach this class have used it recently and like it.

Copies of all of these texts are available at the Science Library reserves. I am not able to provide reading assignments for each of these texts, but have provided the titles of chapters and relevant subsections of the assigned readings in the Watson book to help guide your reading if you choose to use one of these other books.

Other Information Sources: In addition to the texts, I will occasionally give links (on the syllabus page of this site) to relevant information on the web and papers available for free download (when on the UCSC campus). These information sources are intended to supplement the information from lecture and the textbooks.

Homework: There will also be weekly (ungraded) problem sets. These will be posted on the course website.

Course Policies

DRC: If you require disability related accomodations, please see Dr. Hartzog during the first week of class.

Grading: There will be 4 exams. Exams 1-3 will each count toward 20% of the final grade and the final exam will count toward 40% of the final grade. The final exam will be cumulative. The first 3 exams will be short, ~45 minutes and the final will be ~90 minutes.

Regrading exams: If you believe there is a problem in your grade calculation in the form of an accounting error (e.g. the number of points is not added correctly) please forward the information to Dr. Hartzog. If you believe that your score is incorrect because of a correct response which was not recognized as such (after comparing with the answer key), write out your concern on a separate piece of paper, attach it to your test, and turn it in to Dr. Hartzog's mailbox in Sinsheimer Labs within one week from the day the exams were handed back. Note that I reserve the right to regrade the entire exam.

Missed exams: Written make-up tests will not be given. If you miss one exam due to a legitimate excuse (see below), your grade will be based upon an average of the remaining exams. If you miss the final, or more than one exam, an oral makeup exam will be given. Approval to miss a midterm should be obtained in person or by telephone before the regularly scheduled exam is given, if possible. Legitimate excuses include: demonstrable sickness or injury on the day of, or immediately prior to, the scheduled exam; death, serious illness or other catastrophic event in the immediate family; jury duty; days of religious observance as set forth in campus policy; other conflicts beyond the control of the student, at the discretion of the instructor. The deadline for submission of final grade reports may preclude offering an alternate sitting of the final exam. Therefore, students who are unable to take the final exam for legitimate reasons beyond their control, as described above, may request a grade notation of "Incomplete". Arrangements for an incomplete must be made directly with the instructor (in person, by telephone, or by email) no later than 24 hours after the scheduled final exam. An incomplete may only be given if the student is currently passing the class.

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Reading Assignments and Tentative Schedule of Lectures

Date	Topic(s)	Reading (Chapter, Title, *subsection*)
July 28	*Introduction* *Elements of chromosome structure* *Chromosomes and chromatin*	
	Review:	Chapter 1, The Mendelian View of the World Chapter 2, Nucleic Acids Convey Genetic Information Chapter 3, The Importance of Strong and Weak Chemical Bonds Chapter 4, The Structure of DNA Chapter 5, The Structure and Versatility of RNA Chapter 6, The Structure of Proteins
	Reading:	Chapter 8, Genome Structure, Chromatin and the Nucleosome (pp199-234) *Genome Sequence and Chromosome Diversity* *Chromosome Duplication and Segregation* *The Nucleosome* *Higher Order Chromatin Structure* Chapter 7, Techniques of Molecular Biology (pp 147-158, 173-177) *Nucleic Acids: Basic Methods* *Proteins*
July 30	*Transcription overview*	Chapter 13, Mechanisms of Transcription
Aug. 1	*RNA Polymerase II* *Promoters and transcription regulatory proteins*	Chapter 18: Transcriptional Regulation in Prokaryotes (pp 615-635) *Principles of Transcriptional Regulation* *Regulation of Transcriptional Regulation: Examples from Prokaryotes*
Week 2		
Aug. 4	*Transcription activation*	Chapter 19, Transcriptional Regulation in Eukaryotes (pp 657-681) *Conserved Mechanisms of Transcriptional Regulation from Yeast to Mammals* *Recruitment of Protein Complexes to Genes By Eukaryotic Activators* *Signal Integration and Combinatorial Control* *Transcriptional Repressors*
Aug. 6	*Chromatin and transcription*	Chapter 8, Genome Structure, Chromatin and the Nucleosome (pp 236-254) *Regulation of Chromatin Structure* *Nucleosome Assembly* Chapter 19, Transcriptional Regulation in Eukaryotes (pp 687-697) *Gene "Silencing" by Modification of Histones and DNA* *Epigenetic Gene Regulation*
Aug. 8	**Exam 1 (covers lecture material from July 28-Aug. 4)**	
	RNA polymerases I and III *Introduction to pre-mRNA processing-capping and polyadenylation*	

Chapter 13, Mechanisms of Transcription (pp462-464)
Transcription by RNA Polymerases I and III

Week 3

Aug. 11 *Splicing overview*
Pre-mRNA splicing

Chapter 14, RNA Splicing (pp 467-481)
The Chemistry of RNA Splicing
The Spliceosome Machinery
Splicing Pathways

Aug. 13 *Alternative splicing*

Chapter 14, RNA Splicing (pp 482-497)
Variants of Splicing
Alternative Splicing
(Medical Connections 14-4: Defects in pre-mRNA Splicing can Cause Human Disease)

Aug. 15 **Exam 2 (covers lecture material from Aug. 6-11)**

Introduction to translation

Chapter 15, Translation (pp 509-548)
Messenger RNA
Transfer RNA
Attachment of Amino Acids to tRNA
The Ribosome
Initiation of Translation
Translation Elongation
Termination of Translation

Week 4

Aug. 18 *Translation regulation*
ncRNA and RNA stability

Chapter 15, Translation (pp 549-567)
Regulation of Translation
Translation Dependent Regulation of mRNA and Protein Stability

Chapter 20, Regulatory RNAs (pp 711-727)
Regulatory RNAs are Widespread in Eukaryotes
Synthesis and Function of miRNA Molecules
Silencing Gene Expression by Small RNAs

Aug. 20 *DNA Replication*

Chapter 9, The Replication of DNA

Aug. 22 **Exam 3 (covers material from Aug. 13-18)**

Recombination and DNA repair

Chapter 10, The Mutability and Repair of DNA
Chapter 11, Homologous Recombination at the Molecular Level

Week 5

Aug. 25 *Centromeres*
Telomeres

Chapter 9, The Replication of DNA (pp302-310)
Finishing Replication
Chapter 8, Genome Structure, Chromatin and the Nucleosome
Chromosome Duplication and Segregation (pp 208-209)

Aug. 27 *Genome structure and evolution*

Aug. 29 **Review and Final exam** (~50% will cover lecture material from Aug. 20-27, 50% will be cumulative)