

BIOL 4580(6580), Molecular Genetics
Fall Semester 2009, Section A (CRN# 81618 (81640), 4 Credit hours)
Department of Biology, College of Arts & Science, Valdosta State University

Lecture (BC 2022): T & R 11:00 a.m. – 12:15 p.m.

Laboratory (BC 2071): T 2:00 p.m. - 4:50 p.m.

Instructor: Dr. Brian C. Ring

Office: BC 2092

Office hours: **M** 3:30 p.m. – 4:30 p.m. & **R** 2:30 p.m. – 3:30 p.m.

Phone: 249-4841 (Dept. office 333-5759)

Email: bcring@valdosta.edu (**please use WebCT first**)

Pre-Requisites: BIOL 3200 for BIOL 4580. Admission into the graduate program or permission of the instructor for BIOL 6580. Students enrolled as Graduate Students (BIOL 6580) will receive a supplemental syllabus to this main course syllabus.

Course Description: The study of the molecular nature of eukaryotic genomes, with emphasis on biotechnology. The lecture will focus on using modern molecular genetic techniques as a means to understanding complex eukaryotic genomes. Emphasis will be placed on reading current, relevant scientific literature. The laboratory will involve hands-on experience in which the student will learn the latest technology of molecular genetic analysis and manipulation.

Course Outcomes: Upon completion of this course the student should be able to:

- 1) Comprehend the central dogma of molecular biology as illustrated through elegant experimental studies of the phage lambda (**BO3, BO4, & GE4, & GE7**);
- 2) Understand how eukaryotic genomes are organized and experimentally investigated using biotechniques such as molecular biology, genomics, gene expression, and transgenics (**BO3, BO4, & GE4**);
- 3) Develop practical laboratory knowledge and skills through inquiry based experimentation employing molecular genetic techniques (**BO1, BO4, GE5 & GE7**).

These course outcomes support the VSU Biology Department Outcomes # 1, 3, & 4 and the University General Educational Outcomes # 4, 5 & 7 as listed in the VSU Undergraduate Catalogue (see below).

VSU Biology Department Objectives:

BO1. Develop and test hypotheses, collect and analyze data, and present the results and conclusions in both written and oral formats.

BO3. Demonstrate an understanding of the cellular basis of life.

BO4. Relate the structure and function of DNA/RNA to the development of form and function of the organism and to heredity.

VSU General Educational Outcomes:

GE4. Students will express themselves clearly, logically, and precisely in writing and in speaking, and they will demonstrate competence in reading and listening.

GE5. Students will demonstrate knowledge of scientific and mathematical principles and proficiency in laboratory practices.

GE7. Students will demonstrate the ability to analyze, to evaluate, and to make inferences from oral, written, and visual materials.

Required Materials:

Text: 1) Mark Ptashne. *A Genetic Switch: Phage Lambda Revisited*. 2004. 3rd Ed. Cold Spring Harbor Laboratory Press (ISBN # 0879697164)

2) Additional Primary Articles: **TBA**

Laboratory Manual: None. Mainly handouts or laboratory protocols. **TBA**

Graded Course Components: Your final grade will be based on your performance and participation in lecture and the laboratory as outlined below.

Lecture/Discussion Sessions: (350 pts, 70%) Students will be graded on their performance during lecture time based on the following criteria: 3 Lecture Exams (20% each) & Participation (10%).

Lecture Exams will cover material from lecture and will be based upon our discussion of Phage Lambda and various journal articles assigned in class. Exams are composed of multiple choice and/or short answer.

Participation is key to the success of this course. Some lecture will be provided by your instructor, but the majority of the time is left for discussion of the reading assignments by the students. Therefore, attendance in this

course is mandatory and each missed lecture will result in **2 points** lost from your participation grade and missed course time equivalent to greater than 20% (~6 days) will result in a failing grade as per University policy. Attendance may be taken at any time during the lecture or laboratory and used as an indicator of class participation as noted. Laboratories in particular are important not to miss as you will not be able to prepare for lab exams. If you miss **more than 2 laboratory** sessions you will fail this course as per University policy. In the event that a student will miss a lab, s/he should notify the instructor in writing by email and be prepared to provide documentation of the excused absence. It is the instructor's prerogative to accept the excuse or not. **ABSOLUTELY NO LECTURES OR LABORATORIES CAN BE "MADE UP."**

Laboratory: (150 pts, 30%) Two exams worth 75 points each. Exams are composed of multiple choice and/or short answer.

Grade Calculation & Distribution: Final grades will be based on a percentage of your cumulative points relative to the total points possible (e.g. 400/500 = 80% = B). See below chart.

Grade Calculation		Grade Distribution		
Category	Possible Points	Letter	Percentage	Point Range
Lecture Exam 1	100	A	90-100%	450-500
Lecture Exam 2	100	B	80-89%	400-449
Lecture Exam 3	100	C	70-79%	350-399
Participation	50	D	60-69%	300-349
Lab Exam 1	75	F	≤ 59%	≤ 299 points
Lab Exam 2	75			
Total	500			

Notes on grading: Students should note that a grade of "A" in this course represents an exemplary command of the material covered. To obtain this grade of excellence, it is recommended that students study daily, be prepared to participate in class discussion and laboratory sessions, and clarify with their instructor any problems regarding course information, as they arise. Additionally, the instructor may implement an overall curve based on class performance at the end of the course.

Mid-term and Attendance: Students will have several lecture and laboratory assignments to determine their overall grade by the Mid-Term and decide whether to withdraw at the deadline date (**10/08/2009**). Laboratories in particular are important not to miss because all material covered in lab will be on lab exams. If you miss more than 2 laboratory sessions you will fail this course as per University policy. If you are late, your attendance may not be acknowledged. The student is responsible for all material missed regardless of the reason for absences. In the event that a student will miss a lab, s/he should notify the instructor in writing by email and be prepared to provide documentation of the excused absence. It is the instructor's prerogative to accept the excuse or not. **ABSOLUTELY NO LECTURES OR LABORATORIES CAN BE "MADE UP."**

Student identification: Students should have in their possession at all times their VSU student identification card. In order to verify the identification of students officially enrolled in the course, it is the instructor's prerogative to request official student photo identification cards at any time during lecture or during exams.

Academic Dishonesty (e.g. cheating or plagiarism): A student cheating or plagiarizing will be penalized by receiving a zero for the assignment and will be reported to the dean of students. Refer to the Student Code of Ethics in the VSU Student Handbook.

Privacy Act (FERPA): The Family Educational Rights and Privacy Act (FERPA) prohibit the public posting of grades by Social security number or in any manner personally identifiable to the individual student. No grades can be given by email or over the telephone, as positive identification can not be made by this manner.

Students with Disabilities: Students requesting classroom accommodations or modifications because of a documented disability must let me know and must also contact the Access Office for Students with Disabilities located in room 1115 Nevins Hall. The phone numbers are 245-2498 (voice) and 219-1348 (tty).

TENTATIVE LECTURE & LABORATORY OUTLINE:

Week:	Date:	Topics:	Text/ Paper:	Laboratory Topic:
1	Aug. 18 (T)	Course Introduction & Objectives	--	Introduction, Safety, & Inquiry Based learning
	Aug. 20 (R)	Central Dogma & Phage Lambda	Pg. 1-10	
2	Aug. 25 (T)	The Master Elements of Control	Chpt. 1	L1: Common Units & Measures
	Aug. 27 (R)	Continued	--	
3	Sept. 01 (T)	Protein-DNA Interactions & Gene Control	Chpt. 2	L2: Common Stock Solutions & Bacterial Plate Preparation
	Sept. 03 (R)	Continued	--	
4	Sept. 08 (T)	Control Circuits- Setting the Switch	Chpt. 3	L3: Dilution Chemistry
	Sept. 10 (R)	Continued	--	
5	Sept. 15 (T)	How Do We Know?- The Key Experiments	Chpt. 4	L4: Genomic DNA Isolation- Comparing protocols
	Sept. 17 (R)	Continued	--	
6	Sept. 22 (T)	Catch-up & Review	--	L5: DNA Quantification & PCR Amplification
	Sept. 24 (R)	Lecture Exam 1	--	
7	Sept. 29 (T)	DNA Replication & PCR	--	Lab Exam 1
	Oct. 01 (R)	Continued	Paper 1	
8	Oct. 06 (T)	Molecular Biology Techniques I	--	L6: PCR product Electrophoresis, Cloning, & Transformation
	Oct. 08 (R)	Continued	Paper 2	
	Oct. 08 (R)	Midterm- last day to drop course	--	
9	Oct. 13 (T)	Molecular Biology Techniques II	--	L7: Plasmid DNA Purification & digestion
	Oct. 15 (R)	Continued	Paper 3	
10	Oct. 20 (T)	Fall Break- NO CLASS M & T	--	NO LAB
	Oct. 22 (R)	Continued	Paper 4	
11	Oct. 27 (T)	DNA Sequence & Genomics	--	L8: Plasmid DNA electrophoresis & quantification
	Oct. 29 (R)	Continued	Paper 5	
12	Nov. 03 (T)	Catch-up & Review	--	L9: Plasmid DNA sequence preparation & mRNA isolation
	Nov. 05 (R)	Lecture Exam 2	--	
13	Nov. 10 (T)	Gene Expression & Analysis	--	L10: RT-PCR
	Nov. 12 (R)	Continued	Paper 6	
14	Nov. 17 (T)	Gene Mutagenesis & Analysis	--	L11: DNA sequence analysis
	Nov. 19 (R)	Continued	Paper 7	
15	Nov. 24 (T)	Transposable Elements & Transgenics	--	NO LAB
	Nov. 26 (R)	Thanksgiving Break- NO CLASS Wed.-Fri.	--	
16	Dec. 01 (T)	Continued	Paper 8	Lab Exam 2
	Dec. 03 (R)	Catch-up & Review	--	
17	Dec. 11 (F)	Lecture Exam 3	--	10:15 a.m – 12:15 p.m.
				BC 2022

The following two major goals will be accomplished in the laboratory:

- 1) Learn basic molecular biology laboratory skills and methods for isolating two sources of genomic DNA (human & fish).
- 2) Analyze the genome of both organisms above through inquiry based experiments including PCR amplification of genomic fragments, cloning & sequencing of fragments, & reverse transcriptase PCR of mRNA.