

BIOLOGY 247 Applied Biosciences: Biotechnology
Spring 2007
Phoenix College
SYLLABUS

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Biology Dept.

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Office hours: **MW:** 9:15-10 AM; **TTh:** 2:30 - 3:45 PM; **F:** 10-11 AM or by appointment.

Lecture Section: **0538:** TTh 10 - 11:15 AM, room DB-222

Lab Section: **0540:** Th 11:30 – 2:20 AM, room DB-108

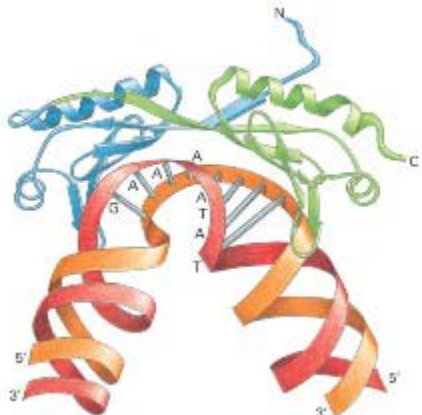
Required Textbook and Lab Manual:

Essential Cell Biology, Alberts et al., 2nd ed., 2004, Garland

Biology 247 Laboratory Manual, furnished by the Biology Department

(All textbooks are available at the PC bookstore)

COURSE DESCRIPTION AND REQUIREMENTS



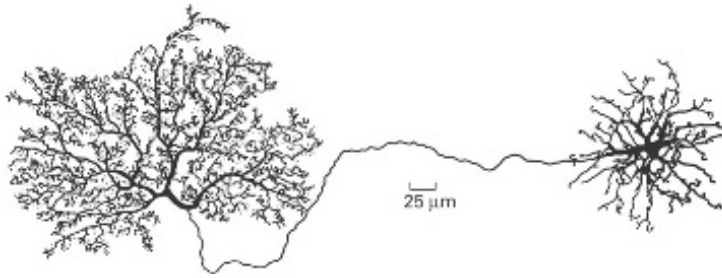
Students will be exposed to an integral, hands-on knowledge of the cell in each and every aspect: from structure and function of organelles, cell membranes, and other cellular structures to molecular processes that make life possible. Labs will use state-of-the-art equipment and technology to involve students in protocols currently used in Biotechnology research labs.

The Arizona Board of Regents has established as a general guideline that each course should require a student to spend a minimum of two hours in preparation outside the class for every hour spent in class. This time should be devoted to reading, taking chapter notes, writing papers, and study for tests and quizzes.

COURSE COMPETENCIES

1. Describe the importance of the cell in understanding the history, structure, and processes of life
2. Describe the chemical foundations of cell processes
3. Describe the structure of proteins, and identify the categories of proteins found in cells
4. Describe the structure and function of nucleic acids
5. Identify the parts of a cell, and describe their structure and function
6. Describe the methods of culturing cells and viruses
7. Describe the methods and uses of recombinant DNA
8. Describe methods of genetic analysis in cell biology
9. Describe the structures and functioning of genes and chromosomes
10. Describe protein synthesis
11. Describe regulation of the eukaryotic cell cycle
12. Describe DNA replication, repair, and recombination
13. Describe gene control of development
14. Describe cellular energetics
15. Describe post-transcriptional and post-translational modifications, protein targeting, and protein sorting
16. Describe transport across cell membranes
17. Gather, analyze, and present data
18. Demonstrate the correct use and application of basic equipment found in a typical molecular and cellular biology laboratory
19. Demonstrate proficiency in bacteriological technique
20. Describe Beer's Law and demonstrate proficiency in using a spectrophotometer
21. Demonstrate proficiency in using a light microscope
22. Describe the Gram staining
23. Demonstrate proficiency in protein and DNA purification
24. Purify both chromosomal and plasmid DNA
25. Define the central dogma of molecular biology
26. Demonstrate proficiency in transformation of both bacteria and yeast
27. Describe recombinant DNA techniques
28. Clone a segment of DNA (e.g. a gene) into a plasmid or expression vector
29. Measure and describe growth kinetics of a eukaryotic organism (yeast)
30. Describe allelic frequencies
31. Describe the Polymerase Chain Reaction (PCR) and design PCR primers
32. Develop a protocol using genetic transformation techniques that "will" correct genetic deficiencies
33. Confirm identity of a DNA sample through restriction enzyme digestion and mapping
34. Describe and perform nucleic acid hybridizations (Southern blotting)
35. Describe maintenance of cultured mammalian cells
36. Describe the correct use of equipment found in a cell culture laboratory

CLASS FORMAT



The lecture and laboratory are designed to complement each other. Materials and topics are presented in a factual and theoretical format accompanied by an experimental format to demonstrate, verify, and solidify these concepts as well as to stimulate interest and develop the skills necessary for further inquiry.

There will be limited access to the lab outside of the scheduled time allotted and therefore, students should always be prepared and use their time methodically and efficiently. It is required that all lab exercises be thoroughly read before coming to the lab and that as many questions as possible be at least partially answered. There are limited supplies for the course and thus, they should be used by the student while in the student's possession and made available to others when not in use.

Students are always encouraged and will sometimes be required to form groups both in and outside of the class for the purpose of discussing, and/or reviewing, and forming conclusions concerning the materials covered in the class and laboratory. In addition, it is recommended that students form associations in the lab in order to complete the assignments and experiments in an efficient, thorough, and timely fashion.

LATE ASSIGNMENTS

I will not accept late assignments. All assignments must be completed to pass the course. Assignments will be collected on the due date at the beginning of the class period. Lab work is considered an assignment.

ATTENDANCE

Attendance is mandatory. Attendance will be taken and recorded at every scheduled meeting. Anything beyond an unexcused absence will have an impact on your grade. According to school policy, students are allowed three (3) unexcused lecture absences and one (1) unexcused lab absences. Please be aware that additional absences will result in withdrawal by the instructor.

Absent or late students will lose in-class assignments or lab quizzes. Please make every effort to be in class and lab on time. Habitual tardiness will have the same effect on your grade than unexcused absences.

If an emergency arises and you must be absent, contact me as soon as possible.

WITHDRAWALS

It is the student's responsibility to withdraw from a class. The instructor's signature is required to

withdraw. Failure to officially withdraw will result in a failing grade.

EVALUATION

There will be four (4) one-page responses on material covered in class and from text readings, four (4) lecture exams, one (1) oral presentation on a selected topic, and twelve (12) lab responses. Students are expected to participate in class discussions and activities. An optional, comprehensive final exam will be given on finals week, and it can be used to replace your lowest grade or make up a missed exam. The comprehensive final exam consists of multiple-choice questions. Lecture exams include multiple-choice questions as well as short-answer questions.

Missed Lecture Exams: Students who miss an exam will be able to make it up **ONLY if they have contacted me before or on the day of the test (at the latest) with a legitimate reason.** Missed exams can be made-up only by taking the comprehensive final exam.

Missed Lecture Responses: Four (4) lecture responses should be completed on the due date. There are no make-ups on lecture responses.

Missed Lab Quizzes: Twelve (12) lab responses should be turned in on the due date. **THERE IS NO MAKE-UP** on missed labs or lab responses. Your lowest lab score will be automatically dropped at the end of the semester.

ACADEMIC MISCONDUCT

Students are expected to behave in an appropriate manner while attending this class. I expect students to be working only on this course during class time. Please avoid class interruptions such as beepers, pagers, and cell phones. Academic Misconduct includes misconduct associated with the classroom and laboratory learning process. Some examples of academic misconduct are cheating, plagiarism, excessive talking, excessive late arrivals, excessive early departures, excessive absences as well as any behavior that disrupts the class.

Please see *2006-2007 Phoenix College Catalog* for further information about PC Policies and Regulations.

RESPECT FOR DIVERSITY

Diversity encompasses: age, life experiences, profession, ethnicity, region, nation, lifestyle, social class, learning style, philosophy of life, sexual orientation, religion, personality, mental and physical challenges, customs, values, gender. In this class, anyone with a different perspective or a different angle on reality will be respected. I am committed to fostering a respect for each other's right to think, feel or act in their own manner.

DISABILITY RESOURCES AND SERVICES

The Disability Support Services (DSS) office coordinates services which will ensure equal access to college programs for students with disabilities. Services include interpreting for the deaf/hard of

hearing, notetaking, reading, scribing, adaptive technology, testing accommodation, alternative text formatting, and special seating arrangements. Some classroom accommodations such as interpreting services, audio taped texts and handouts, enlarged print and brailled materials require preparation time. For this reason, students with disabilities are encouraged to contact the DSS office prior to registration and provide us with the necessary documentation. All disability-related information provided to DSS remains confidential.

Students who are aware of any physical or non-physical disability that may affect their performance in class are kindly encouraged to inform me during the first week of class, or to contact the Office of Disability Support Services (DSS) in the Learning Center Building (phone # (602) 285-7477 V/TDD) in order to accommodate their specific needs.

GRADING

- A- 90-100%
- B- 80-89%
- C- 70-79%
- D- 60-69%
- F- below 60%

Lecture Exams (4 at 100 each):	400 points
Lecture Responses (4 at 25 each):	100 points
Lab Responses (12 at 30 each):	360 points
Presentation:	100 points
TOTAL:	960 points

Please note: The comprehensive final exam is OPTIONAL and can be taken to replace your lowest grade lecture test or make up a missed lecture test. The final exam is worth 100 points.

BIOLOGY 247 Applied Biosciences: Biotechnology
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COURSE ITINERARY- Spring 2007

<u>Week</u>	<u>Topics, Readings (*), Labs, and Assignments</u>
Week 1 (Jan 16 - 18)	Introduction to the Cell: Cell Compartments and Cell Membranes <i>Chapter 1</i> <i>Technique: Cell Counting and Microscopy</i> <i>Lab Title: Cellular Size and Cellular Scale</i>
Week 2 (Jan 23 - 25)	Introduction to the Cell: Molecular Organization of Cells. Chemical Components of Cells <i>Chapters 2, 5</i> <i>Technique: X-ray Diffraction, Protein Sequencing</i> <i>Lab Title: Analysis of DNA Structure and Protein-DNA Interactions Using Protein Explorer</i>
Week 3 (Jan 30 – Feb 1)	Structural and Molecular Organization of Cells: The Plasma Membrane. The Nuclear Membrane. <i>Chapters 11, 12, 15</i> <i>Technique: Thin Layer Chromatography</i> <i>Lab Title: Chemical Composition of Cell Membranes</i>
* February 1	Lecture Response #1 due
Week 4 (Feb 6 - 8)	Structural and Molecular Organization of Cells: Organelles, Intracellular Compartments, and Cytoskeleton. <i>Chapters 12, 14, 15, 17</i> <i>Technique: Cell Fractioning. Centrifugation.</i> <i>Lab Title: Cell Fractioning and Isolation of Organelles</i>
* February 8	HOURLY EXAM # 1
Week 5 (Feb 13 - 15)	Cell Transport: Membrane Transport. <i>Chapter 12, 15</i> <i>Technique: Combining Cellular and Molecular Labeling. Blocking Molecular Activity</i> <i>Lab Title: Respiration of Sugars by Yeast and Fluorescent In Situ Hybridization (FISH)</i>

Week 6 (Feb 20 - 22)	Cell Transport: Protein Sorting and Vesicular Transport. <i>Chapter 15</i> <i>Technique: Database Search and Database Analysis</i> <i>Lab Title: Database Search and Analysis. The Cholesterol Gene.</i>
Week 7 (Feb 27 – March 1)	Cell Communication: Cell Signaling; Cell Adhesion <i>Chapter 16</i> <i>Technique: Analysis of Electromicrographs. Freeze Fracturing.</i> <i>Lab Title: Visit to The Biodesign Institute at ASU</i> http://www.biodesign.asu.edu/ Lecture Response # 2 due
* March 1	
Week 8 (March 6 - 8)	DNA Structure and Chromosome Structure: Nucleosomes. <i>Chapter 5</i> <i>Technique: S1 Nuclease Assay, Radiolabeling, Karyotyping.</i> <i>Lab Title: Isolation and Quantification of Plasmid DNA.</i> HOURLY EXAM # 2
* March 8	
Week 9 (March 12 - 16)	Spring Break
Week 10 (March 20 - 22)	DNA Structure, Replication, Repair, and Recombination <i>Chapter 6</i> <i>Technique: Spectrophotometry</i> <i>Lab Title: Enzymatic Digestion of Plasmid DNA. Restriction Maps.</i>
Week 11 (March 27 - 29)	Gene Structure and Function <i>Chapter 7</i> <i>Technique: Real Time Polymerase Chain Reaction (RT-PCR)</i> <i>Lab Title: DNA Electrophoresis. Restriction Maps (cont.). Chromosome 16 PCR.</i> Lecture Response 3 # due
* March 29	
Week 12 (April 3 - 5)	From DNA to Protein: Transcription <i>Chapter 7</i> <i>Technique: Northern Blotting, Transcription Assays.</i> <i>Lab Title: Analysis of PCR Products.</i> Presentation Proposal due HOURLY EXAM # 3
* April 3	
* April 5	

Week 13 (April 10 - 12)	Control of Transcription: Gene Regulation. Movable Genes. Transcription Factors. <i>Chapter 8</i> <i>Technique: Western Blotting, Protein Assays.</i> <i>Lab Title: Protein Fingerprinting</i>
Week 14 (April 17 - 19)	From DNA to Protein: Translation <i>Chapter 7</i> <i>Technique: Database Searching, BLAST, DNA and Protein Evolution. Proteomics.</i> <i>Lab Title: Western Blot</i>
Week 15 (April 24 - 26)	Cell Cycle: Cell Division and Chromosome Rearrangements. Sexual Reproduction and Gene Rearrangements. <i>Chapter 9, 20</i> <i>Technique: DNA Transformation, Basic Genetic Selection.</i> <i>Students' Presentations (during lab sessions)</i>
* April 26	Lecture Response # 4 due
Week 16 (May 1 - 3)	Selected Topics: Cell Cycle and Cell Division. Programmed Cell Death. Cell Differentiation, Developmental Biology and Tissue Formation. Cancer Molecular Biology <i>Chapter 18, 21</i> <i>Techniques: The Making of a Transgenic Organism. ES Cells Techniques.</i> <i>Students' Presentations (during lab sessions)</i>
* May 3	HOURLY EXAM # 4
Week 17 (May 7 - 1)	Finals Week. There are no classes or labs on Finals Week.
* May 8, 2007 (Tues)	FINAL EXAM @ 10:00 – 11:50 AM (in DB-222) There will be absolutely NO exceptions to this time.

Your instructor reserves the right to revise or rearrange this schedule based upon the needs of the class.

(*) Additional readings may be assigned. Please refer to lecture outlines for further reading assignments.
