

Texas A&M University - Corpus Christi

SYLLABUS

BIOLOGY 3410.001 - CELL BIOLOGY

(4 Credits)

Fall 2009**Class Meetings:** Monday/Wednesday/Friday 10:00 - 10:50 AM Science & Technology 104**Laboratory:** Section 101 Tuesdays 2:00 - 4:50 Science & Technology 301
Section 102 Tuesdays 5:30 - 8:20 Science & Technology 301
Section 103 Mondays 2:00 - 4:50 Science & Technology 301

You will be required to come to laboratory during unscheduled times to monitor, complete or setup experiments. You will also be required to complete the Lab Safety course (PSCI 0091) online, outside of scheduled class times during the first week of classes. You will not be allowed into lab without this certification. **Remember to make a printout of your quiz scores and bring it to lab.**

Prerequisites: Genetics (Biol 2416); You are also expected to have satisfactorily completed Biology I (Biol 1406) and Organic Chemistry I (Chem 3311)**Instructor:** Dr. Kirk Cammarata
Office: ST 319B
Lab: NRC 3227
Phone: 825-2468 (Office)
825-2145 (Lab)
E-mail: Kirk.Cammarata@tamucc.edu*Office Hours:* [Subject to change pending advance notice]

M 11:15 - 12:00

T 8:30 - 9:30

F 11:15- 12:00

Please note that you are welcome to come by my office or lab at anytime, though you may wish to call first. I will be glad to help you if I am not busy. I am likely to be in lab on Wednesday – Friday afternoons.

Required Texts: Alberts et al., (2010). *Essential Cell Biology*, 3rd Edition, Garland Publishing, New York. (Comes with CD-ROM) ISBN 978-0-8153-4129-1
OR: ISBN 978-0-8153-4130-7 [Paperback Version]

You will need to purchase a packet of laboratory handouts

You must obtain, bring and maintain the Qwizdom Class Response “CLICKER”

Other Required Items for Laboratory: You will need a laboratory notebook, “sharpie” and a calculator. A binder is recommended to accommodate handouts, etc. Students will be responsible for obtaining - and wearing – a **laboratory coat** and **safety glasses**. A USB drive is also helpful to capture lab data.

Additional Resources: The Instructor will make additional learning resources (books, reserve articles, software) available at the library, laboratory or on Classwire or WebCT. You may use these with proper sign-out procedure.

A CD-ROM, *ECB3*, is packaged with your textbook and contains textbook figures and an abundance of video clips/animations to demonstrate the dynamic nature of cellular processes. It also contains self-quizzes and thought questions. Relevant multimedia highlights can be found in each chapter. Each chapter also has a “How We Know” section which focuses on the experimental approach to cell biology. Key Terms are highlighted in bold text and explained in an illustrated glossary at the back of the book. Essential Concepts are listed at the end of each chapter. **An emphasis of the course is to stimulate you to integrate your knowledge and apply it to unfamiliar situations.** Questions posed in the margin of the text and at the end of each chapter will guide you to think about the information you have just read. Some problems will be assigned for each chapter and answers are found at the back of the book.

There is also a publisher-based website associated with the textbook:

www.classwire.com/garlandscience . This site contains text figures, animations and links to additional resources.

PowerPoint lecture notes, supplementary materials (eg readings, Study Guides for exams, lab data, etc) and assignments will be posted on the WebCT site for this course (WebCT Help x2825). Last year’s course PPT notes are currently posted, and updated versions of the notes will be posted upon completion of each chapter or topic.

Course Description: A study of cellular structures and processes to explore strategies for cellular and organismal function. Emphasis will be placed on the biology and chemistry of basic cellular mechanisms. Topics include biomolecules, cellular architecture, gene regulation, catabolism, protein structure and function, membrane structure and function, transport, enzymes, cellular trafficking, cytoskeleton, cell communication/signal transduction, regulation of cell proliferation and cancer. Laboratory will emphasize basic techniques common to the overlapping fields of cell biology, biochemistry, and molecular biology. Hot topics include SiRNA, genomics, regulation of chromatin structure, SNPs and DNA microarrays. Critical thinking and analytical skills are practiced.

Evaluation: Your final grade will be based on the percentage you earn out of the total possible points, weighted as specified below. Individual extra credit is not possible, but bonus points may be built into exams or other assignments. Statistical manipulations, *if used* (at the Instructor's discretion), will be performed only once, at the end of the semester. A 10-point grading scale will be used:

A = 90 - 100 %
B = 80 - 89.9 %
C = 70 - 79.9 %
D = 60 - 69.9 %
F = 0 - 59.9 %

Components of Course Grade (Tentative)

I. Lecture (75 %)

| | | |
|--|----------|------------|
| 3 Exams @ 100 pts | = | 300 |
| Final Exam | = | 100 |
| Quizzes | = | 100 |
| Homeworks and Other Assignments | = | 50 |
| Attendance | = | 50 |

II. Laboratory (25 %)

| | | |
|--------------------------------|----------|------------|
| Lab Reports/Assignments | = | 150 |
| Lab Quizzes | = | 100 |

The time schedule may require adjustment. Should this be the case, the assignments and weighting may change slightly. Additional assignments may or may not be provided at the Instructor's discretion. Such assignments might include homeworks, group projects, reading assignments, quizzes, etc. Regardless of any such changes, the lecture and laboratory weighting of your grade shall remain at 75 % and 25 %, respectively. For example, if you make 90 % of total points available for the lecture and 80 % of total points available for the laboratory portion, then your grade would be calculated as:

$$(0.9 \times 75) + (0.8 \times 25) = (67.5) + (20) = 87.5/100 \text{ possible} = B$$

An assignment will likely be due during the last week of class.

Every attempt will be made to follow the time and evaluation schedules shown here. It is the student's duty to attend each class session and be aware of all assignments, deadlines, changes, etc.

Explanation of Assignments:

Exams will be a mixture of multiple choice, matching, fill-in the blank, short answer, labeling, calculations and essay questions. Some will require analysis and interpretation of data or experimental design to assess critical thinking skills. Some questions will be derived from laboratory activities. The **Final Exam (Wednesday, Dec. 16 from 8:00 - 10:30 AM)** will contain new material from the end of the semester.

Quizzes may be given at any time in class, and will often be taken using the required Class Response “Clickers”. There will be no makeups. **Homeworks and other assignments** may be given in class. The other assignments may include data interpretation, experimental design, calculations, opinion papers, research article summaries, etc. They will generally be due at the start of lecture class the following week. You are encouraged to get together and work on them as a group. However, unless specified otherwise, the assignments must be turned in individually and be written ***in your own words, NOT COPIED***. An assignment grade of ZERO will be given if the work is not in your own words.

Attendance at class is required, and will be monitored by either direct roll call or through the use of the Class Response “Clickers”. You must bring a functional “Clicker” to class each day. If roll is taken by “Clicker” and you do not have yours, you will be counted as absent. Please do not ask for an exception. Each student will be given a 3-absence grace allowance before losing attendance points. If you use another (absent) student’s clicker, in addition to your own, in an attempt to count the absent student as present, you will be counted as absent yourself.

Other Course Requirements:

1. All students **must subscribe to the class listserv, using your official University-mandated email account** (firstinitiallastname@islander.tamucc.edu). **You may ask questions of interest to the instructor or other students on the class listserv, eg. clarification of an assignment, as well as receive important class announcements. You are encouraged to subscribe to the Opportunities Listserv as well.**

To subscribe, send an e-mail to [“Cellbio-list-request@sci.tamucc.edu”](mailto:Cellbio-list-request@sci.tamucc.edu). Make sure that your e-mail address appears in the “From:” heading, and that the word “subscribe” is typed in the subject line. You will receive a subscription acknowledgement confirming that you have done everything correctly. To post messages to the listserv, send to [“Cellbio-list@sci.tamucc.edu”](mailto:Cellbio-list@sci.tamucc.edu). **Because of security concerns, you should post messages from the official TAMUCC computer account (Islander) that is used to subscribe to the listserv.** At the end of class, please send an e-mail to [“Cellbio-list-request@sci.tamucc.edu”](mailto:Cellbio-list-request@sci.tamucc.edu) with **“unsubscribe”** in the subject heading. Please use this service to ask questions about class materials, dates, assignments, etc.

You should also subscribe to the **Opportunities Listserv** using the same procedure: [“opportunities-list-request@sci.tamucc.edu”](mailto:opportunities-list-request@sci.tamucc.edu) This service provides notification of scholarships, research and volunteer opportunities and science-related job opportunities.

2. ALL E-MAIL COMMUNICATIONS WITH THE INSTRUCTOR OR LAB TA MUST BE MADE THROUGH YOUR OFFICIAL UNIVERSITY E-MAIL (@ISLANDER), BY UNIVERSITY RULE.

3. It is important to do the specified readings BEFORE coming to class for coverage of that topic. Lecture will consist of an overview, answering questions and problem-solving. The PPT notes may not be reviewed in detail except in regard to specific questions. Quizzes will be used to make sure you stay on-track. You must take responsibility for your education.

Other Expectations:

You are expected to attend all classes and labs in a timely manner. Important new material, as well as schedule changes and quizzes may occur at any time. It is expected that you will take notes, ask/answer questions, and participate in group activities. Learning is more than spoonfeeding, memorization and regurgitation. While memorizing is an important first step, you should also be able to apply knowledge by linking data and synthesizing into useful concepts. Please review assigned chapter questions, view media presentations and take the self-quizzes provided on the textbook CD or website. Form study groups and question each other using the textbook figures as prompts.

You are responsible for your own education. Take notes in class as some new information may be presented. Lecture notes from the instructor, when made available, do not represent everything you need to know. Read the book and handouts for further detail not covered in class, and to be prepared for laboratory. If you don't understand, then please ask, or see the instructor after class. **Don't allow yourself to fall behind. Be diligent and thorough on written assignments and examination answers.** If you are not sure of an answer, at least try. For many people, putting anything down on paper clarifies their thinking and helps with recall. Also:

- Be aware of university-imposed deadlines (ie drop dates)
- Be aware of test times and dates, including changes which may be announced in class
- Check your exams for clerical errors. The test score is not the end of the learning process. Review tests to determine why you missed an answer. Correcting your mistakes is an effective way to learn material (*reflective learning*).
- Work on all assigned homework problems in a timely manner. Seek tutorial help from classmates or the course/laboratory Instructors.
- Keep track of your progress in class.

The following procedures will be enforced:

- **You must be prepared to present a photo ID at all examinations**
- **Different test forms may be prepared for a single examination. Follow instructions**
- **If you leave an examination room—for any reason—you must hand in your test and you will not be allowed to resume the examination. Attend to personal matters (e.g., rest room visits) before the examination.**

Policy on Academic Dishonesty:

Academic dishonesty, in all its forms, including plagiarism, is not tolerated. Students found responsible for violating this rule WILL be prosecuted to the fullest extent of University Regulations (see the current TAMU-CC catalog). Be especially careful when completing assignments or lab reports. Everything should be in your own words.

LATE WORK will not be accepted, except as below, or unless otherwise specified.

Attendance Policy:

Attendance is the student's responsibility. You are responsible for the material covered in every lecture, even if it is not in the book, regardless of your attendance. **Nothing** missed during an **unexcused** absence can be made up. An excused absence allows us to make alternative arrangements to complete an assignment. Only **unavoidable** absences are excused. Routine events (holiday travel, non-emergency medical visits, parent-teacher conferences, household or auto repairs) **should be scheduled to avoid conflicts with class**. An acceptable excuse *must* be:

- from an appropriate source (doctor, dentist, funeral director) stating the nature of the event
- In writing, on official letterhead, and signed (it will not be returned)
- *presented prior to, or within 1 week of, the absence*
- ***It must state the dates for which the excuse applies***

There are No make-up examinations: For some scheduled events, you may arrange to take a lecture exam before, **but not after**, its scheduled time. Quizzes cannot be made-up.

Policy on Disruptive Behavior:

As adult university students, you are expected to act with courtesy and common sense. Disruptive, disrespectful, or abusive language/behavior towards anyone in class (student, staff, faculty) will not be tolerated and could result in permanent removal from class. This includes tardiness to class, talking in class, insubordination, and **electronic disturbances (cell phones, ipods, gameboys, etc)**. **Turn it off**. Hazardous materials are used in the laboratory so "play" or reckless behavior will not be allowed. Children are not allowed in class or lab.

Disability and Veterans' Services: Texas A&M University-Corpus Christi is committed to providing persons with disabilities an equal opportunity to access campus facilities, resources and programs. The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. Support and accommodations are also available for returning veterans who experience cognitive and/or physical access issues in the classroom or on campus. Our Office of Disability Services arranges such support and academic accommodations. To make a request, or for more information, call (361) 825-5816 or visit Driftwood 101. It is important to contact the Office of Disability Services in a timely fashion as it will take time for them to review requests and prepare accommodations and accommodation letters.

Grade Appeals: The Texas A&M University-Corpus Christi University Rules and Procedures (Section B [Academic Program], Part 13 [Students]: 13.02.99.C2 [Student Grade Appeals] and 13.02.99C2.01 [Student Grade Appeal Procedures]) provides details regarding the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process. Consult the University Rules and Procedures specified above (accessible through the University Rules and Procedures website at http://www.tamucc.edu/provost/university_rules/index.html).

Laboratory

The **laboratory activities** provide an opportunity to integrate classroom concepts with the real purpose of science: **Discovery**. Laboratory contributes significantly towards your grade. **Quizzes** (5 - 20 pts each) may be given at any time during the lab period, and may cover material from the previous lab or from the current one being performed that day. Thus, you should come prepared and on-time. **Attendance is mandatory**. You may not take the quiz if you arrive late. Everyone should keep a lab notebook to record protocols, perform calculations, record experimental observations, and make notes. All entries should be titled and dated. This information will be essential when writing laboratory reports. **Lab reports** will be completed in a variety of formats, including on provided handouts, or in formats to be specified. They are generally **due at the start of lab the following week**.

Laboratories will generally be led by the Teaching Assistant whose contact information is provided below. Some labs may be led by the course instructor or a guest instructor.

Laboratory 101 & 102 Instructor:

Office: ST 301
825-5467 (Lab-call **only** during office hours)
E-mail: POrdner@islander.tamucc.edu
Office Hours: [Location: ST 301]

Laboratory 103 Instructor: Valerie Chilton

Office: ST 301
825-5467 (Lab-call **only** during office hours)
E-mail: VChilton@tamucc.edu
Office Hours: [Location: ST 301]

IMPORTANT DATES:

| | |
|------------------|--|
| Aug. 26 | Classes begin |
| Sept 7 | Labor Day (Campus Closed) |
| Nov 6 | Last day to drop with a "W" |
| Nov 25-27 | Thanksgiving Break (Campus Closed) |
| Dec 8 | Last day of classes |
| Dec 16 | Final Examination (Wed., 8:00 - 10:30 AM) |

LEARNING OUTCOMES

Knowledge: Students should be able to:

1. List the major macromolecules found in the cell and the monomers from which these polymers are constructed.
2. Understand the properties of each class of macromolecule and the roles that each plays in various cellular functions.
3. Understand the properties of water and the roles it plays in all cellular processes, eg. protein folding.
4. Describe the structure and differentiate the functions of the major parts of the cell, including:
 - cell (plasma) membrane
 - nucleus
 - chromosomes
 - nucleolus
 - mitochondria
 - chloroplasts
 - endosomes
 - lysosomes
 - endoplasmic reticulum
 - peroxisomes
 - ribosomes
 - golgi complex
 - cytoskeleton
 - Clathrin-coated vesicles
 - extracellular matrix
5. Describe the structure and properties of biological membranes.
6. Distinguish various kinds of transport across biological membranes.
7. Explain the roles of ATP and NADH (NADPH) in cellular activity and metabolism.
8. Describe how electron transport is linked to ATP generation.
9. Outline the relationships among light absorption, oxygen release, electron transport, and carbon dioxide fixation in photosynthesis.
10. Understand information flow embodied by the Central Dogma, and how this can be used to study and manipulate gene expression.
11. Understand various cellular processes in terms of the **energetics** of the molecules involved.
12. List components of the cytoskeleton and describe how they maintain or modify cell structure.
13. Describe techniques for characterizing DNA and proteins.
14. Explain what SiRNA is and its role in gene regulation.
15. Understand the approach and promise of “genomics” or other “Systems Biology” approaches.
16. Describe examples of chemical signaling mechanisms in cells and organisms.
17. Describe regulation and control of the cell cycle
18. Understand alterations to cell function which accompany cancer

LEARNING OUTCOMES (Continued)

Skills: Students should be able to:

1. Formulate an hypothesis from available information and devise means for testing this hypothesis experimentally.
2. Propose practical experimental procedures to:
 - a. fractionate, label or visualize specific cellular compartments or components.
 - b. identify, quantify, and characterize protein and nucleic acid.
 - c. determine DNA sequences and their polymorphisms
3. Use the following equipment in a safe and professional manner:
 - a. high power light and phase-contrast microscopes, including oil immersion lens.
 - b. centrifuge
 - c. spectrophotometer
 - d. incubators
 - e. electrophoresis equipment
 - f. micropipetting devices
 - g. standard laboratory glassware.
4. Take necessary safety precautions when dealing with electricity, hazardous chemicals, flammable solvents, acids or alkalies, or microorganisms.
5. Graph and interpret the results of cell biology experiments.
6. Communicate experimental procedures, results and outcomes in a professional manner.
7. Perform basic laboratory mathematics including concentration and dilution calculations.

LAB SAFETY Training: Mandatory Laboratory Safety training must be completed outside of the regularly scheduled lab time via WebCT. You must register for and complete one of the Lab Safety courses scheduled as PSCI 0091. A printout of the quiz scores will be required at the first laboratory meeting. Do Not Forget to bring this with you, it is required for lab !

LABORATORY GUIDELINES

1. No tobacco, gum, eating, or drinking in the lab. Keep hands (and feet !) out of mouth.
2. Wash your hands before and after each laboratory experiment.
3. Make sure your work area is clean before you begin and clean thoroughly when you finish. This includes glassware, trash, and equipment. Be sure all equipment or flames are turned off before you leave. Return all materials to their proper storage location. Points will be deducted for porcine habits.
4. Label everything (tubes, plates, containers) accurately. A thorough label will contain initials of lab group, date, and specific contents or identity.
5. Read protocols through before starting work. Follow instructions specifically. Read reagent labels carefully, especially concentrations, before using to make sure it is what you think it is.
6. Be familiar with all equipment. Ask instructor for help if you are unsure. **DO NOT PLAY WITH EQUIPMENT !** It is fragile, expensive and may be dangerous.
7. **ASK QUESTIONS ABOUT ANYTHING YOU DO NOT UNDERSTAND !**
8. Report all accidents promptly.
9. You have a "Right to Know" about the materials you are working with. Most substances come

with an MSDS sheet (material safety data sheet) to describe any potential hazards. These are kept on file. The "Merck Index" also provides useful safety information.

Lab safety is taken seriously. Be sure to wear lab coat, long pants and closed-toe shoes at all times, and safety glasses and gloves when appropriate. Please ask any questions about safety if you are unsure !

You will be required to come to lab outside of the regularly scheduled lab periods in order to setup, observe or complete experiments. Please make arrangements with a lab partner if you have a schedule conflict. In science, you must "do what it takes" to complete the experiments.

OUTLINE AND TENTATIVE SEQUENCE OF TOPICS (Chapters)

1. (1) Introduction to Cells
 - Eukaryotic Cells
 - Unity and Diversity of Cells
 - Insights from genome projects
 - Microscopy
2. (2) Chemical Components of Cells
 - Molecules
 - Water
 - Structure and Properties of Biological Macromolecules
3. (3) Energy, Catalysis and Biosynthesis
 - Catalysis and Energy Use by Cells
 - Activated Carrier Molecules and Biosynthesis
4. (4) Protein Structure and Function
 - Shape and Structure of Proteins
 - How Proteins Work
5. (5, 7, 8) How Cells Read the Genome
 - Chromatin Structure & Accessibility
 - Central Dogma
 - Protein Turnover
 - RNA and Origins of Life
 - Control of Gene Expression and Protein Regulation
 - Transcriptional Switches & Chromatin Regulation
 - Molecular Mechanisms Underlying Development
 - Post-Transcriptional Control: Riboswitches, siRNA and Gene Regulation
6. (9, 10) How Genomes Evolve
 - Sources of Genetic Variation
 - Evolutionary Relationships
 - The Human Genome
 - Hybridization-Based Tools
 - Genomics: A Global Perspective of Gene Regulation
 - DNA Microarrays: High-Throughput Global Gene Expression Studies
7. (11) Membrane Structure
 - Lipid Bilayers
 - Membrane Proteins

8. (12) Membrane Transport
 - Carrier Proteins and Their Functions
 - Ion Channels and Membrane Potentials
 - Ion Channels and Signaling in Nerve Cells
9. (13) How Cells Obtain Energy From Food
 - Breakdown of Sugars and Fats
 - Storing and Utilizing Food
10. (14) Energy Generation in Mitochondria and Chloroplasts
 - Mitochondria and Oxidative Phosphorylation
 - Electron Transport Chains and Proton Pumping
 - Chloroplasts and Photosynthesis
 - Cellular Evolution
11. (15) Intracellular Compartments and Transport
 - Membrane-bounded Organelles
 - Protein Sorting
 - Vesicular Transport
 - Secretory Pathways
 - Endocytic Pathways
12. (16) Cell Communication
 - General Principles and Types of Cell Signaling
 - G-Protein-Coupled Receptors
 - Enzyme-Coupled Receptors
13. (17) The Cytoskeleton
 - Intermediate Filaments
 - Microtubules
 - Actin Filaments
14. (18) Cell-Cycle Control and Cell Death
 - Overview of the Cell Cycle
 - The Cell-Cycle Control System
 - Mitosis
 - Cytokinesis
 - Control of Cell Numbers in Multicellular Organisms
 - Programmed Cell Death (Apoptosis)
15. (20) Tissues and Cancer
 - Extracellular Matrix and Connective Tissues
 - Epithelial Sheets and Cell-Cell Junctions
 - Tissue Maintenance and Renewal
 - Disruption by Cancer

General Disclaimer:

The Instructor reserves the right to modify the schedules and policies in this syllabus if and when necessary. Such changes will be announced during regularly scheduled lecture or laboratory periods, but no attempt will be made to contact students who were absent when an announcement was made. Nevertheless, all students are responsible for abiding by all announced changes, and it is a student's responsibility to obtain this information. Changes will be announced in a timely manner, but be aware that some modifications may be implemented without prior warning.

TENTATIVE SCHEDULE

Subject to change. It is your responsibility to attend class and be aware of changes.

| <u>Week</u> | <u>Lecture</u> | <u>Date</u> | <u>Topic</u> | <u>Chapters</u> | <u>Notes</u> |
|-------------|----------------|-------------|--|-----------------|---------------------------------------|
| 1 | 1 | 8/26 | Pre-Test, Introduction to Cells; Organelles, Unity/Diversity | 1 | |
| | NO LAB | | | | Do Online Safety Training |
| | 2 | 8/28 | Model Systems, Genomes, Chemical Bonds, Composition of Cells; Water | 1 2 pp.44-78 | |
| 2 | 3 | 8/31 | Water, Macromolecules & Properties | 2 pp.44-78 | |
| | LAB 1 | | Intro, Lab Safety; Lab Calculations, Micropipeting | Handouts | Bring Safety Quiz Confirmation |
| | 4 | 9/2 | Energy & Order, Redox; Enzymes, Free E | 3 | |
| | 5 | 9/4 | Activated Carrier Molecules; Protein Structure & Function | 3; 4 | Reading: "Ecology of Tumors" |
| 3 | | 9/7 | LABOR DAY – No Class | | |
| | NO LABS | | | | (but work on your handouts !) |
| | 6 | 9/9 | Protein Conformations and Energy | 4 | |
| | 7 | 9/11 | Protein Function: Catalysis | 4 | |
| 4 | 8 | 9/14 | Protein Function: Motions | 4 | |
| | LAB 2 | | Lab Calculations Revisited; Micropipetting Expt 206-Part I: Affinity Chromatography | Handouts | |
| | 9 | 9/16 | Chromatin Structure & Accessibility | 5:179-192 | |

| <u>Week</u> | <u>Lecture</u> | <u>Date</u> | <u>Topic</u> | <u>Chapters</u> | <u>Notes</u> |
|-------------|----------------|-------------|--|-----------------|-------------------------|
| | | 9/18 | EXAM 1 (Lecs 1-8) | | |
| 5 | 10 | 9/21 | Central Dogma, Overview of Gene Expression; Protein Turnover; RNA World | 7 | |
| | LAB 3 | | Expt 206-Part II: Protein Electrophoresis; X1 Review | | |
| | 11 | 9/23 | Control of Gene Expression; Transcriptional Switches; Molecular Mechanisms of Development; | 8 | |
| | 12 | 9/25 | Post-Transcriptional Control; SiRNA Regulation Genetic Variation; Genome Evolution | 8, 9 | SiRNA Readings |
| 6 | 13 | 9/28 | The Human Genome Nucleic Acid Hybridization & Assay of Gene Expression | 9, 10 | DNA Microarray Readings |
| | LAB 4 | | Expt 102: Sickle Cell Hemoglobin | | |
| | 14 | 9/30 | Membrane Structure and Function; Lipid Bilayers | 11 | |
| | 15 | 10/2 | Membrane Proteins; Membrane Transport | 11; 12 | |
| 7 | 16 | 10/5 | Membrane Transport: Passive, Active, Na-K Pump | 12: pp 387-417 | |
| | LAB 5 | | Expt 205-Part I: Western Blot | | |
| | 17 | 10/7 | Ca, H ⁺ Pumps; Ion Channels; Membrane Potential | 12: pp 387-417 | |
| | 18 | 10/9 | Voltage-Gated Channels | 12: pp 387-417 | |
| 8 | 19 | 10/12 | Catabolism: Glycolysis; Fat Breakdown | 13 | |

| <u>Week</u> | <u>Lecture</u> | <u>Date</u> | <u>Topic</u> | <u>Chapters</u> | <u>Notes</u> |
|-------------|----------------|-------------|--|-----------------|----------------------------------|
| | LAB 6 | | Expt 205-Part II: Protein Evolution & Relatedness | | |
| | 20 | 10/14 | Catabolism: Citric Acid Cycle | 13 | |
| | | 10/16 | EXAM 2 (Lecs 9-18) | | |
| 9 | 21 | 10/19 | Mitochondria; Ox. Phos.: Organelle, Electron Transport, H+ Pumping | 14; pp 453-476 | |
| | LAB 7 | | Expt 306: Nucleosome Structure; X2 Review | | |
| | 22 | 10/21 | Mitochondria; Ox. Phos.: Organelle, Electron Transport, H+ Pumping | 14; pp 453-476 | |
| | 23 | 10/23 | H+ Gradients; ATP Synthesis | 14; pp 453-476 | |
| 10 | 24 | 10/26 | Chloroplasts and Photosynthesis | 14 pp 476-491 | |
| | LAB 8 | | Human Genomic Analysis I: Genomic DNA & PCR | Handouts | |
| | 25 | 10/28 | Photosynthetic Electron Transport & ATP Synthesis | 14 pp 476-491 | |
| | 26 | 10/30 | Intracellular Compartmentation and Transport: Organelles | 15 | |
| 11 | 27 | 11/2 | Protein Sorting: Direct Translocation into Organelles | 15 | Last Day To Drop with "W" |
| | LAB 9 | | Human Genomic Analysis II: Gel Analysis, PCR Cleanup & DNA Sequencing Rxs | 10; Handouts | |
| | 28 | 11/4 | Cotranslational Insertion, Vesicular Transport | 15 | |
| | 29 | 11/6 | Secretory Paths | 15 | |
| 12 | 30 | 11/9 | Endocytic Paths | 15 | |

| <u>Week</u> | <u>Lecture</u> | <u>Date</u> | <u>Topic</u> | <u>Chapters</u> | <u>Notes</u> |
|-------------|----------------|-------------|--|----------------------|-----------------------|
| | LAB 10 | | Expt 702: Cell Surface Receptors | | |
| | 31 | 11/11 | Cell Communication: Principles and Receptor Classes | 16 | |
| | 32 | 11/13 | Cell Communication: Ion Channels, G-Protein-Linked | 16 | |
| 13 | | 11/16 | EXAM 3 (Lecs 19-30) | | |
| | LAB 11 | | Microscopy Lab; X3 Review | Chapt 1, Handouts | |
| | 33 | 11/18 | Cell Communication: G-Protein-Linked; Enzyme-Linked | 16 | |
| | 34 | 11/20 | Cytoskeleton: Intermediate Filaments, Microtubules | 17 pp 571-598 | |
| 14 | 35 | 11/23 | Cytoskeleton: Microtubules, Actin | 17 pp 571-598 | |
| | LAB 12 | | Human Genomic Analysis III: Sequencing Rx Cleanup; Load CEQ | 10; Handout | Long Lab! |
| | 36 | 11/25 | Cell Cycle, Division & Control | 18 | |
| | | 11/27 | THANKSGIVING BREAK – No Class Friday | | |
| 15 | 37 | 11/30 | Cell Death & Extracellular Controls | 18 | |
| | LAB 13 | | Human Genomic Analysis IV: Bioinformatics Analysis of Human DNA Sequence | Handout | |
| | 38 | 12/2 | Tissues: Extracellular Matrix, Connective Tissues | 20 | |
| | 39 | 12/4 | Epithelial Sheets, Junctions, and Tissue Maintenance | 20 | |
| 16 | 40 | 12/7 | Cancer/Tumor Ecology Article | 20 | Tumor Ecology Reading |

| <u>Week</u> | <u>Lecture</u> | <u>Date</u> | <u>Topic</u> | <u>Chapters</u> | <u>Notes</u> |
|-------------|----------------|--------------|--|-----------------|--------------|
| | LAB 14 | | Lab Wrap Up Review Period | | |
| 18 | | 12/16 | FINAL EXAM (8:00-10:30 AM) (Lecs 31-40) | | |