

Med 530 Course A
Foundations of Medicine: Anatomy, Physiology, and Pathology
4 units

Master of Science in Global Medicine
Department of Medical Education Affairs
Keck School of Medicine
University of Southern California

Instructors: Dr. Monica G. Ferrini, Dr. Jorge N. Artaza

USC blackboard (BB): available at <https://blackboard.usc.edu/>

– The syllabus, announcements, lecture slides, online homework assignments, and grades will be posted on BB.

Required Textbooks:

Essential Cell Biology, 3rd Edition. Author (s): Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander D Johnson Julian Lewis, and et al. Garland Science editor ISBN: 9780815341291

PhysioEx 9.0 Laboratory Simulations in Physiology by P. Zao, T stabler et al. Publisher: Pearson ISBN-13: 978-0-321-81557-6.

Suggested Textbooks

- Molecular Biology of the Cell 5th Edition by Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. Garland Science editor ISBN:9780815341055

General Pathology: Kumar V, Abbas AK, and Fausto N and Aster JC. Robbins and Cotran: Pathologic basis of Disease. Eighth Edition. Elsevier Saunders Company, 2010.

Anatomy and Physiology: Human Anatomy and Physiology 8th (2010) by Elaine Marieb & Katja Hoehn. Publisher: Pearson; ISBN: 0-8053-9591-1.

Course description

This course is designed to give the necessary background for students before taking Anatomy, Physiology and Pathology courses Meds 530B, and 530C. It covers the structural detail and molecular function of the different part of the cells.

Lectures will include the basics of chemistry and extensive cell biology including topics such as cell shape, motility, transport across membranes, signal transduction processes and cellular function required for cell growth, differentiation and death.

Course Objectives

Upon completion of this course, students should be able to:

- Understand the architecture and function of living cells
- Apply computer simulation to understand structure and functions of the living cells covered in the course.
- Integrate information from current clinical literature to elucidate biology principles in papers review session with active participation by the students.

Course Structure

Lectures

Students are responsible for all topics and issues discussed in the lectures, even if they are not covered in the textbook. All lectures will be posted on blackboard at least one day before the lecture day.

Presentations assignments 20%

One or two presentations of scientific paper review will be assigned to each student at the beginning of the semester. Students will discuss the papers in a journal club discussion format **Questions about each of the presentation will be included in the final exam.**

Class participation, Homework & Online Laboratories

Will account for 10% of the final semester grade.

Each student is responsible for completion of his/her own assignment/s and submission by the assign due day and time. Late assignments will not be accepted.

Midterm exams and Final

- 2 in-class Midterms worth 40% (20% each), and a final exam worth 30% of your total grade.
- Midterms will have 50 questions, and the final exam will have 100 questions

Grading System:

Grading Scale:	B+: 88-89%	C+: 78-79%	D+: 68-69%	F: <59%
A: 93-100%	B: 83-87%	C: 73-77%	D: 63-67%	
A-: 90-92%	B-: 80-82%	C-: 70-72%	D-: 60-62%	

Lectures Description:

Session 1: (8/26) Introduction to cell part 1: Universal features of cells on Earth, diversity of genome and tree of life, microscopy of the cell the prokaryote cell.

Reading: Chapter 1, Essential Cell Biology, 3rd Edition.

Session 2: (8/28) Introduction to cell part 2 the eukaryote cell: structure function, Basic overview of cell organelles.

Reading: Chapter 1. Essential Cell Biology, 3rd Edition.

Session 3: (9/4) Basic chemistry. Overview about properties of atoms, molecules, compounds, bonds and chemical reactions.

Reading: Chapter 2. Essential Cell Biology, 3rd Edition.

Session 4: (9/9) Chemical Components of Cells. Carbon Compounds, the Four Major Families of Small Organic Molecules: Sugars, fatty Acids, Amino Acids and nucleotides. Macromolecules in the cells: covalent and non covalent bonds.

Reading: Chapter 2. Essential Cell Biology, 3rd Edition.

Session 5: (9/11) Membrane Structure. The lipid bilayer, composition, fluidity. Proteins integral protein, accessories proteins; protein channels. Aquaporin.

Reading: Chapter 11. Essential Cell Biology, 3rd Edition.

Session 6: (9/16). Membrane Transport. Principles of membrane transport. Transporters and their functions. Ion channels and the membrane potential. Ion channels and signaling in nerve and muscle cells

Reading: Chapter 12. Essential Cell Biology, 3rd Edition.

Session 7: (9/18): Laboratory & presentation Session: Students will present papers selected from PUBMED related to cell diversity, membranes and lipid rafts. Students will give a brief introduction, present the methods, results of the paper and the discussion. Presentation length: 15 minutes. Students will provide a power point presentation that will include 5 relevant questions for discussion.

Session 8: (9/23) Metabolism Energy catalysis. The use of energy by cells. Free energy and catalysis. Activated carrier molecules and biosynthesis

Reading: Chapter 3. Essential Cell Biology, 3rd Edition.

Session 9: (9/25) How cell obtain energy from food. The breakdown and utilization of sugars and fats. Regulation of metabolism

Reading: Chapter 13. Essential Cell Biology, 3rd Edition.

Session 10: (9/30) Energy generation in Mitochondria and Chloroplasts. Mitochondria and oxidative phosphorylation. Molecular mechanisms of electron transport and proton pumping. Chloroplasts and photosynthesis. The origins of chloroplasts and mitochondria.

Reading: Chapter 14. Essential Cell Biology, 3rd Edition.

Session 11: Midterm 1 (10/2)

Session 12: (10/7) Protein Structure and Function. The shape and structure of proteins.how proteins work. How proteins are controlled. How proteins are studied

Reading: Chapter 4. Essential Cell Biology, 3rd Edition.

Session 13: (10/9) DNA and chromosomes. The structure and function of DNA. The structure of eukaryotic chromosomes. The regulation of chromosome structure

Reading: Chapter 5. Essential Cell Biology, 3rd Edition.

Session 14: (10/14) DNA Replication, Repair, and Recombination. DNA replication. DNA repair. Homologous recombination. Mobile genetic elements and viruses

Reading: Chapter 6. Essential Cell Biology, 3rd Edition.

Session 15 (10/16) From DNA to protein: How to cells read the genome Part 1 From DNA to RNA. From RNA to protein. RNA and the origins of life

Reading: Chapter 7. Essential Cell Biology, 3rd Edition.

Session 16: (10/21) From DNA to protein: How to cells read the genome. Part 2 continuation of part 1

Reading: Chapter 7. Essential Cell Biology, 3rd Edition.

Session 17: (10/23) Control of gene expression An overview of gene expression. How transcriptional switches work. The molecular mechanisms that create specialized cell types. Post-transcriptional controls

Reading: Chapter 8. Essential Cell Biology, 3rd Edition.

Session 18: (10/28) How genes and genomes Evolve. Generating genetic variation. Reconstructing life's family tree. Examining the human genome

Reading: Chapter 9. Essential Cell Biology, 3rd Edition.

Session 19: (10/30) Manipulating genes and cells. Manipulating and analyzing DNA molecules. DNA cloning. Deciphering and exploiting genetic information

Reading: Chapter 10. Essential Cell Biology, 3rd Edition.

Session 20: (11/4) presentation Session 2. Students will present papers selected from PUBMED related to DNA, protein and control of gene expression. Students will give a brief introduction, present the methods, results of the paper and the discussion. Presentation length: 15 minutes. Students will provide a power point presentation that will include 5 relevant questions for discussion.

Session 21: Midterm 2. (11/6)

Session 22: (11/11) Intracellular Compartments and Transport. Membrane-enclosed organelles. Protein sorting. Vesicular transport. Secretory pathways. Endocytic pathways

Reading: Chapter 15. Essential Cell Biology, 3rd Edition.

Session 23: (11/13) Cell communication. General principles of cell signaling. G-protein-coupled receptors. Enzyme-coupled receptors

Reading: Chapter 16. Essential Cell Biology, 3rd Edition.

Session 24: (11/18) Cytoskeleton. Intermediate filaments. Microtubules. Actin filaments

Reading: Chapter 17. Essential Cell Biology, 3rd Edition.

Session 25: (11/20) Cell division cycle. Overview of the cell cycle. The cell-cycle control system. S phase. M phase. Mitosis. Cytokinesis. Control of cell number and cell size

Reading: Chapter 18. Essential Cell Biology, 3rd Edition.

Session 26: (11/25) Sex and Genetics. The benefits of sex. Meiosis and fertilization. Mendel and the laws of inheritance. Genetics as an experimental tool

Reading: Chapter 19. Essential Cell Biology, 3rd Edition.

Thanksgiving (11/27-30)

Session 27: (12/2) Cell responses to stress, inflammation and injury hyperplasia, dysplasia, hypertrophy, inclusions, cell death: necrosis vs. apoptosis.

Reading: Chapter 1 Kumar V, Abbas AK, and Fausto N and Aster JC. Robbins and Cotran: Pathologic basis of Disease. Eighth Edition. Elsevier Saunders Company, 2010.

Session 28: (12/4) Presentation and review session Students will present papers selected from PUBMED related to cell communication, control of cytoskeleton, mitosis and meiosis. Students will give a brief introduction, present the methods results of the paper and the discussion. Presentation length: 15 minutes. Students will provide a power point presentation that will include 5 relevant questions for discussion.

Session 30: Final Week of 12/11-18 (TBA)

Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be certain the letter is delivered to the instructor as early in the semester as possible. DSP is located in on the University Park campus in STU 301 and is open 8:30 a.m. – 5:00 p.m., Monday through Friday. The phone number is (213) 740-0776.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:

<http://www.usc.edu/dept/publicationis/SCAMPUS/gov/>

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be a suspicion of academic dishonesty. The Review process can be found at <http://www.usc.edu/student-affairs/SJACS/>