

## SYLLABUS

**QUARTER:** Spring 2015

**NAME OF COURSE:** Cell Physiology - PHYS 115

**LENGTH OF COURSE:** 44 hours, 4 units (4 hours theory session/week)

**COURSE DESCRIPTION:** The structure and function of the cell and all its organelles are described, illustrating how life processes in the cell are reflected in the functioning of the whole body. Topics covered in detail are: the structure and function of cell membranes, transport of material across membranes, protein structure and function, motility in cells (microfilaments and microtubules), carbohydrates and cellular respiration, ATP, nucleic acids, protein synthesis, mitosis and meiosis.

**PREREQUISITES:** NONE

**COURSE OFFERED BY:** Physiology/Pathology Dept.  
Sue Ray, M.S., Department Chair

**COURSE INSTRUCTOR:** Mitch Halloran  
Email: shalloran@lifewest.edu  
Phone: (916) 410-7133

**LECTURE DAYS and HOURS:** Mondays & Wednesdays, 9:40 – 11:50

**OFFICE HOURS:** Wednesdays 12-1 pm in Room 147 (Adjunct Faculty Room)

**REQUIRED TEXT:** Class notes.

**RECOMMENDED TEXTS:** Marieb EN. *Human Anatomy & Physiology*. 10<sup>th</sup> edition 2011,  
ISBN-10: 0321695984 | ISBN-13: 978-0321695987

Becker WM. *The World of the Cell*. 8<sup>th</sup> edition, 2011  
ISBN-10: 0321716027 | ISBN-13: 978-0321716026

Raven P. *Biology*. 9<sup>th</sup> edition, 2010 ISBN-10: 0073532223  
ISBN-13: 978-0073532226

All books on reserve in library

## **METHOD OF INSTRUCTION:**

Lectures and group study (Students' presentations) centered on topics related to the course contents; on-line and learning center (library) research; in-class reviews, reporting and assessments with instructor; access to MOODLE site for links to reference citations; in-class presentations; creation and maintenance of student portfolio of materials and resources. Each **group is limited to FOUR students** (the number of students/group is variable according to the total number of the class in each quarter); exceptions to work independently requires instructor approval.

## **STUDENTS' PRESENTATIONS:**

Student groups will select a topic of their choice related to the course contents to present to the class. As an example, students make a presentation based upon role of different types of protein in cell functions, mitochondria as power houses and its special mode of inheritance, adverse effects of high carbohydrate and fat diet, the chromosomal theory of inheritance, human genome project, cloning, gene therapy, etc. The presentations will be between 10-15 minutes. Peer-reviewed references must be provided and properly cited; if websites are cited then substantiating references for those sources from texts and the peer-reviewed literature must be provided.

The presentation may include but not limited to:

1. An introduction to the topic including a short historical background.
2. Review of literature related to the subject of presentation.
3. Recent advances in the field of the subject of presentation.
4. Clinical correlation/significance (if applicable).

Each group will e-mail their presentation to [galeyd@lifewest.edu](mailto:galeyd@lifewest.edu) not later than one day following the date of your oral presentation to the class.

## **EVALUATION:**

- (1) **WEEKLY QUIZZES:** The instructor leads a discussion of the topics studied in the previous week followed by a quiz covering those topics. Total 5 quizzes/course. **(10 Points)**
- (2) **MIDTERM EXAM (Week 5):** Midterm exam is due at Week-5 and it will cover all lectures studied up to the date of midterm exam. The exam may include any of the following types of questions: multiple choice questions (MCQs), modified essay questions (MEQs), extended matching questions (EMQs) and short essay questions (SAQs). **(30 Points)**
- (3) **ORAL PRESENTATIONS:** Final presentations are scheduled Prein weeks 8-10 and will be maximum **15 minutes** in length, including set-up and Q&A. Attendance is required on the days of student presentations. Participation by attendees in discussion following the presentations is expected. Topics covered by students' presentations will be included in the final exam. **(10 Points)**

(4)**FINAL EXAM** (Week 11): Emphasis is taken from all lectures studied and the student groups' oral presentations. The exam may include any of the following types of questions: multiple choice questions (MCQs), modified essay questions (MEQs), extended matching questions (EMQs) and short essay questions (SAQs). **(50 Points)**

**Total = 100 Points**

**GRADING:**

A = 4.0, 90 - 100%, good

C = 2.0, 70 - 79%, average

B = 3.0, 80 - 89%, above average

F = 0.0 student must repeat entire course

In order to maintain satisfactory academic progress, a student must maintain a 2.0 average or better in every course. **Any grade less than C must be remedied by repeating the class.**

**ATTENDANCE:** College policy applies.

**MAKE-UPS:** College policy applies.

**EXTRA CREDIT:** There will be no extra credit work accepted in this class.

**CHEATING:** A student who cheats in any way will automatically fail the course and his/her name submitted for appropriate administrative action.

**CONDUCT AND RESPONSIBILITIES:** College policy applies.

**PROCEDURES FOR REVIEWING EXAMS**

The instructor has not authorized distribution of old exams. Any possession of old exams is prohibited. The instructor may either conduct review sessions in class or may meet with a student to review his or her exam during office hours for two weeks following the exam (unless there is a shorter time period until the last scheduled office hour during the last week of classes.)

Students may not review mid-term exams during final exam week. The possession of any exam other than during a review session constitutes unprofessional conduct.

**REQUEST FOR SPECIAL TESTING:** College policy applies.

**ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES**

If you have approved accommodations, please make an appointment to meet with your instructor as soon as possible. If you believe you require an accommodation, but do not have an approved accommodation letter, please see the Academic Counselor Lori Pino in the Dean's Office. Contact info: lpino@lifewest.edu or 510-780-4500 ext 2061

## **COURSE OBJECTIVES:**

1. Review basic chemistry, learn the chemical components of the cell, understanding how they are assembled to form the structure of cell membranes and organelles.
2. Describe structure and function of the phospholipid bilayer in cell membranes and know the details of the "fluid mosaic model" of membrane structure.
3. Describe the different functions of proteins and glycoproteins in the cell membrane.
4. Describe different types of cell junctions involved in joining cells to form tissues.
5. Differentiate between active, passive and facilitated transport across membranes and to cite several examples of each, relating these examples to cellular functions such as nutrition or conduction of nerve impulses.
6. Explain that the energy source for active transport can be supplied either from ATP, or else from exergonic (passive) movement of another molecule or ion.
7. Describe how rough and smooth endoplasmic reticulum differ from each other in structure and function, and to understand how membrane material circulates throughout the cell, forming parts of one organelle after another.
8. Describe form and function of the Golgi apparatus, not only as a "packaging station" but also in the completion of glycoproteins and formation of lysosomes.
9. Describe the functions of lysosomes and list the several ways in which the cell is protected from unwanted lysosomal digestive activity.
10. Define dual role of peroxisomes in protecting the cell from free radical damage caused by unwanted oxidation, and in using oxidation as a way to fight against invading pathogens and to oxidize toxins and drugs.
11. Define and describe metabolism, and related concepts such as anabolism, catabolism, exergonic and endergonic reactions, oxidation and reduction.
12. Describe the structure of ATP, defining its components, and explaining why the cell needs to make ATP.
13. Describe the reactions of glycolysis, the Krebs cycle and electron transport chain, explain the purpose of these pathways in the economy of the cell, and distinguish the difference between substrate level phosphorylation and oxidative phosphorylation.
14. Explain why mitochondrial structure is well-suited to the role of carrying out the Krebs cycle, oxidative phosphorylation and beta oxidation of fatty acids.
15. Compare the similarities and differences in structure and function, between microfilaments, microtubules and intermediate filaments. Explain how these structures are used for cell motility, in cell division, and to form the cytoskeleton and karyoskeleton.

16. Describe the structure of DNA and RNA, identifying all the purines and pyrimidines, to be familiar with the double helix of DNA, base-pairing of complementary strands, use of templates, antiparallel strand orientation, B-DNA and Z-DNA, and different levels of coiling of the DNA with histones, to form chromosomes.
17. Describe the structure and functions of the nucleus, nuclear membrane, chromosomes and nucleolus.
18. Compare between roles of the three types of RNA, and explain how the genetic code to code for amino acid sequence.
19. Define transcription, translation and replication, explain where, why and how each of the processes occurs in the cell.
20. Describe the cell cycle, explain the need for DNA replication and the different phases of interphase.
21. Describe the events of each phase of mitosis.
22. Describe meiosis, compare between mitosis and meiosis, and explain how the amount of DNA and the number of chromosomes are reduced in meiosis.
23. Define the terms: genome, diploid, haploid, genotype, phenotype.

#### **STUDENT LEARNING OUTCOMES:**

1. Student will be able to describe the chemical structure of the cell and cell membrane.
2. Student will be able to explain the mechanisms of cellular transport, cellular junctions and signaling methods.
3. Student will be able to describe cellular metabolism.
4. Student will be able to describe the cellular organelles and their functions.
5. Student will be able to explain the mechanism of cell division, basic cellular genetics, protein synthesis and basic mechanisms of regulation at a genetic and protein level.

**CELL PHYSIOLOGY (PHYS. 115) COURSE CALENDAR (SPRING 2015):**

Week/Date		Teaching Activity	Topic/Description
WK1	Apr 6	Lecture-1	Cell structure and function
		Lecture-2	Chemistry Review -Reactivity, Bonds, Reactions, Enzymes, Water
	Apr 8	<b>HC Exams</b>	
WK2	Apr 13	Lecture-3	Chemistry Review -Inorganic Components in the Cell
		Lecture-4	Chemistry Review -Organic Components Carbohydrate & Proteins
	Apr 15	<b>QUIZ-1 &amp; REVIEW</b>	
		Lecture-5	Chemistry Review -Lipids
WK3	Apr 20	Lecture-6	Cell Membrane Structure & Function
		Lecture-7	Cell Signaling & Receptors
	Apr 22	Lecture-8	Cell Junctions
		Lecture-9	Cell membrane transport-Passive Transport
WK4	Apr 27	<b>QUIZ-2 &amp; REVIEW</b>	
		Lecture-10	Cell membrane transport-Active Transport (Part-I)
	Apr 29	Lecture-11	Cell membrane transport-Active Transport (Part-II)
		Lecture-12	Bulk Transport
WK5	May 4	<b>MIDTERM EXAM</b>	
		<b>EXAM DISCUSSION</b>	
	May 6	Lecture-13	Metabolism & ATP (Part-I)
		Lecture-14	Metabolism & ATP (Part-II)
WK6	May 11	<b>QUIZ-3 &amp; REVIEW</b>	
		Lecture-15	Cell Organelles-I (Mitochondria, Endoplasmic Reticulum, Golgi Complex, Lysosomes and Peroxisomes)
	May 13	Lecture-16	Cell Organelles-II (Microfilaments, Microtubules, Nucleus, Cell Cycle.
		Lecture-17	Nucleic acids & Chromosomes
WK7	May 18	<b>QUIZ-4 &amp; REVIEW</b>	
		Lecture-18	Protein synthesis
	May 20	Lecture-19	Mitosis
		Lecture-20	Meiosis
WK8	May 25	<b>QUIZ-5 &amp; REVIEW</b>	
		Students' Presentations	Final presentations will be maximum <b>15 minutes</b> in length, including set-up and Q&A. Attendance is required on the days of students presentations. Participation by attendees in discussion following the presentations is expected. Topics covered by students' presentations will be included in the final exam
	May 27	Students' Presentations	
WK9	Jun 1	Students' Presentations	
	Jun 3	Students' Presentations	
WK10	Jun 8	Students' Presentations	
	Jun 10	Students' Presentations / REVIEW	
WK11	Jun 15- to Jun 19	<b>FINAL EXAM</b>	