

EL CAMINO COLLEGE
COURSE OUTLINE OF RECORD – Approved

Course Acronym:	PHYO
Course Number:	31
Descriptive Title:	Human Physiology
Division:	Natural Sciences
Department:	Anatomy/Physiology
Course Disciplines:	Biological Sciences
Catalog Description:	This course is a study of cellular physiology and the functional aspects of the following human body systems: circulatory, respiratory, digestive, excretory, reproductive, muscle, nervous and endocrine. In the laboratory, experiments are performed to demonstrate principles discussed in lecture. This course is designed primarily for those majoring in the Health Sciences.
Prerequisite:	Anatomy 32 AND Chemistry 20 or Chemistry 21A or Chemistry 4 with a minimum grade of C
Co-requisite:	
Recommended Preparation:	
Course Length:	Full Term
Hours Lecture (per week):	2
Hours Laboratory (per week):	6
Outside Study Hours:	4
Total Hours:	144
Course Units:	4
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	Prior to July 1992
Transfer UC:	Yes
Effective Date:	
General Education: ECC	Area 1 - Natural Sciences
Term:	
Other:	
CSU GE:	Area B2 - Physical Universe and its Life Forms: Life Science
Term:	
Other:	
IGETC:	Area 5B - Biological Science
Term:	

Other:	
Student Learning Outcomes:	<p>SLO # Language Students will be able to use language appropriate to physiological functions and the health sciences.</p> <p>SLO #2 Instruments Students will demonstrate the use of instruments to gather physiological data.</p> <p>SLO #3 Mechanisms Students will be able to describe mechanisms and explain physiological processes that occur in the human body on cellular, organ, systemic, and organismal levels.</p>
Course Objectives:	<ol style="list-style-type: none"> 1. Explain the major functions of human body systems. 2. Compare and contrast the different cell types, tissues, and organs that compose the body systems and their functions. 3. Explain the basic types of chemical reactions and interactions among and within cells that occur in the body. 4. Explain how the body systems work together as a whole. 5. Compare and contrast the methods whereby the body maintains homeostasis. 6. Describe clinical disorders related to the topics discussed, as well as current treatments. Analyze case studies related to these disorders.
Major Topics	<p>I. Physiology Introduction (1 hour, lecture)</p> <ol style="list-style-type: none"> A. Levels of Organization B. Homeostasis C. Scientific Method <p>II. Laboratory Activities (6 hours, lab)</p> <ol style="list-style-type: none"> A. Metric Measurements B. Scientific Method <p>III. Chemical Principles (2 hours, lecture)</p> <ol style="list-style-type: none"> A. Atoms and Molecules <ol style="list-style-type: none"> 1. Composition 2. Chemical bonds B. Acids and Bases C. Inorganic compounds and solutions D. Organic compounds E. Energy in Cells F. Basic Chemical Reactions <ol style="list-style-type: none"> 1. Intracellular 2. Extracellular G. Enzymes <ol style="list-style-type: none"> 1. Role 2. Regulation <p>IV. Laboratory Activities (9 hours, lab)</p> <ol style="list-style-type: none"> A. Molecule Construction B. Organic Molecule Chemical Determination

V. Cells (3 hours, lecture)

- A. Cell Organelles
- B. Movement across Membranes
 - 1. Osmosis
 - 2. Diffusion
 - 3. Active transport
 - 4. Vesicular transport
- C. Gene Expression
- D. Genes
 - 1. Structural
 - 2. Operator
 - 3. Regulator
- E. Structure of DNA and RNA
- F. Cell Division
 - 1. Mitosis
 - 2. Meiosis

VI. Laboratory Activities (9 hours, lab)

- A. Cell Transport

VII. Blood and Lymph (4 hours, lecture)

- A. Blood
 - 1. Components
 - 2. Blood buffer system
- B. Red Blood Cells
 - 1. Hemoglobin structure
 - 2. Metabolism of heme
 - 3. Anemia and Polycythemia
 - 4. Erythropoiesis
- C. White Blood Cells
 - 1. Type
 - 2. Function
 - 3. Leukopoiesis
 - 4. Leukocytosis and leukopenia
- D. Hemostasis
 - 1. Mechanism (steps of hemostasis)
 - 2. Inhibition by therapeutic agents
- E. Blood Types
- F. Lymphatic System and Immunity
 - 1. Innate Immunity
 - 2. Adaptive Immunity
 - 3. Role in organ transplantation
 - 4. Allergic Response
 - 5. Inflammatory Response

VIII. Laboratory Activities (9 hours, lab)

- A. Blood Analysis
- B. Blood Cell Count and Blood Typing

IX. Circulatory System (4 hours, lecture)

- A. Heart
 - 1. Action potential in pacemaker and contractile cardiac cells
 - 2. Conduction pathway
 - 3. Cardiac cycle
 - 4. Cardiac Output
- B. Blood Vessels and hemodynamics
 - 1. Capillary exchange
 - 2. Blood flow
 - 3. Mean Arterial Pressure
 - a. Factors affecting blood pressure
 - b. Regulation
 - c. Hypertension
- C. ECG
- D. Common disorders

X. Laboratory Activities (12 hours, lab)

- A. Electrocardiography
- B. Blood Pressure Measurements
- C. Calculating Mean arterial pressure and pulse pressure
- D. Blood Flow Dynamics
- E. Case studies

XI. Respiratory System (3 hours, lecture)

- A. Mechanics of Respiration
- B. Gas exchange
- C. Transport of oxygen and carbondioxide
- D. Lung Volumes and Capacities
- E. Regulation of Breathing
- F. Exercise and respiration
- G. Common disorders

XII. Laboratory Activities (6 hours, lab)

- A. Spirometry
- B. Respiratory Mechanics

XIII. Digestive System and Metabolism (3 hours, lecture)

- A. Digestive processes
- B. Gastrointestinal motility patterns
- C. Glycolysis
- D. Aerobic Metabolism
- E. Citric Acid Cycle
- F. Cytochrome Oxidase System
- G. ATP formation
- H. Regulation of Metabolism
- I. Clinical Problems

XIV. Laboratory Activities (6 hours, lab)

- A. Digestive Processes
- B. Clinical cases

XV. Urinary System (3 hours, lecture)

- A. Kidney Functions
- B. Steps of Urine Formation
- C. Glomerular Filtration (GF) and Glomerular Filtration Rate (GFR)
 - 1. Mechanism of GF
 - 2. Regulation of GFR
- D. Tubular reabsorption processes
- E. Tubular secretion
- F. Countercurrent Mechanism
- G. Renal Clearance
- H. Regulation of Blood Volume
- I. Regulation of Electrolytes
- J. Micturition
- K. Acid-Base regulation

XVI. Laboratory Activities (9 hours, lab)

- A. Urinalysis
- B. Renal Function Tests
- C. Acid-Base balance

XVII. Muscle System (3 hours, lecture)

- A. Skeletal Muscle Contraction
 - 1. Twitches
 - 2. Summation
 - 3. Fatigue
 - 4. Relaxation
 - 5. Force of contraction
 - 6. Motor unit
- B. Cardiac and smooth muscle contraction
- C. Action potentials in skeletal, cardiac, and smooth muscles

XVIII. Laboratory Activities (6 hours, lab)

- A. Skeletal Muscle Physiology
- B. Electromyography

XIX. Nervous System (5 hours, lecture)

- A. Neurons
 - 1. Electrical signals
 - 2. Neuronal circuits
 - 3. Signal Transmission at Synapses
- B. Functions of various parts of the Brain
- C. Integrative function of the Cerebrum
 - 1. Wakefulness and Sleep
 - 2. Memory
 - 3. Language
- D. Sensory system
 - 1. The Somatic Sensory System
 - 2. The Olfactory System
 - 3. The Gustatory System
 - 4. The Visual System
 - 5. The Auditory and Vestibular Systems

- E. Cranial nerves
- F. Spinal Cord
 - 1. Location
 - 2. Function
 - 3. Disorders
- G. Autonomic Nervous System (ANS)
 - 1. Sympathetic and Parasympathetic nervous Systems
 - 2. Receptors and neurotransmitters
 - 3. Functions of ANS

XX. Laboratory Activities (21 hours, lab)

- A. Reflexes
- B. General Sensations
- C. Cranial Nerves
- D. Vision
- E. Hearing and Equilibrium
- F. Taste and Smell

XXI. Endocrine System (3 hours, lecture)

- A. Endocrine glands and endocrine tissues
 - 1. Hormones
 - 2. Functions
 - 3. Interrelationship
 - 4. Regulation and Negative feedback loop
- B. Common Disorders

XXII. Laboratory Activities (6 hours, lab)

- A. Endocrine Hormones and Actions
- B. Case studies

XXIII. Reproductive System (2 hours, lecture)

- A. Components: male and female
 - 1. Structure
 - 2. Function
- B. Fertilization
- C. Embryo and Fetus
 - 1. Developmental processes
- D. Birth
 - 1. Process
 - 2. Methods of delivery
- E. Lactation

XXIV. Laboratory Activities (9 hours, lab)

- A. Genetic Problems
- B. Inheritance Simulation
- C. DNA Replication and Protein Synthesis

XXV. Lab Activities (0 hours)

Greater than 80% of the labs are based on hands-on activities supporting the course outcomes.

Total Lecture Hours:	36
Total Laboratory Hours:	108
Total Hours:	144
Primary Method of Evaluation	2) Problem solving demonstrations (computational or non-computational)
Typical Assignment Using Primary Method of Evaluation:	<p>In the space provided, answer the question below. Be sure to use complete sentences and justify your answer.</p> <p>Suppose that gene b is sex-linked, recessive, and lethal. A man mates with a woman who is heterozygous for this gene. If this couple had four living daughters and 3 living sons, what would be the predicted ratio sex of these children?</p>
Critical Thinking Assignment 1:	<p>Case study: A 58-year-old woman comes to the clinic complaining of excessive sweating for the last few months. On questioning it seems that she often feels warm and flushed, even when others in the room are comfortable with the temperature. On further questioning she reveals a history of frequent stools, insomnia, and heart palpitations. She denies taking any medications or supplements, remembers no recent illnesses, and has never suffered these symptoms before. She has noticed, however, a painless lump in her neck that has been present at least since the symptoms started. Vital signs are: temperature 38.0 degrees C (100.4 degrees F), blood pressure 138/88 mmHg, pulse 121 per min, and respirations 20 per min. Examination reveals a thin woman with a bounding pulse and a slight resting tremor. Palpation of the thyroid reveals a palpable, nontender, half-centimeter nodule in the left lobe of the gland. Ocular and skin examinations are normal. Fine-needle aspiration of the nodule is performed, and, after review by a pathologist, reveals normal tissue. A thyroid function panel reveals:</p> <p>TSH - 0.01 24 μU/L</p> <p>Thyroxine - 13.2 μg/dL</p> <p>Answer the following questions on a separate sheet of paper.</p> <p>What is the diagnosis of this patient? What are some possible etiologies for this patient? What organ systems are involved in the progression of this patient? What is cardiac palpitation? What is the mechanism involved in the heart palpitations? What is the painless lump in her neck called?</p>
Critical Thinking Assignment 2:	<p>Lou is a 57 year old man who is 5' 10" tall and weighs 220 lbs. He has a stressful, sedentary desk job during the week and usually feels too tired to do anything but watch TV on the weekend. He has recently noticed that he is often excessively thirsty, hungry, and urinates frequently. Lou mentions these things to his doctor, and his doctor orders some tests. The results of Lou's tests are:</p> <p>Blood pressure - 150/88 Blood plasma triglycerides - 220 mg/dL (Normal triglyceride is _____) Total cholesterol - 217 mg/dL (Normal cholesterol is _____)</p>

	<p>-LDL 177 mg/dL (Normal LDL is _____) -HDL 30 mg/dL (Normal HDL is _____) Fasting blood glucose - 120 mg/dL (Normal FBG is _____) Waist circumference - 42 in. (Normal is _____)</p> <p>Answer the following questions on a separate sheet of paper.</p> <p>Calculate Lou's BMI. Is Lou's BMI considered normal or obese for his height and weight? Why does Lou feel tired, hungry, and thirsty so much? What may be the cardiovascular consequences of Lou's high triglyceride and cholesterol levels? Is it possible that Lou has metabolic syndrome? If you were Lou's doctor, what would you tell him about the consequences of type II diabetes and what he needs to do to avoid developing the disorder?</p>
Other Evaluation Methods:	Completion, Homework Problems, Laboratory Reports, Matching Items, Multiple Choice, Other Exams, Quizzes, Reading Reports, Written Homework
Instructional Methods:	Demonstration, Discussion, Lab, Lecture, Multimedia presentations, Role play/simulation
If other:	
Work Outside of Class:	Answer questions, Problem solving activity, Required reading, Study, Written work (such as essay/composition/report/analysis/research)
If Other:	
Up-To-Date Representative Textbooks:	<p>Marieb and Mitchell. <u>Human Anatomy and Physiology Laboratory Manual</u>. 13th ed. Pearson Publishing, 2019.</p> <p>Silverthorn. <u>Human Physiology: An Integrated Approach</u>. 8th ed. Pearson Publishing, 2019.</p> <p>Zao and Stabler. <u>Physio Ex 10.0 Laboratory Simulations in Physiology</u>. Pearson Publishing, 2019.</p>
Alternative Textbooks:	
Required Supplementary Readings:	
Other Required Materials:	
Requisite:	Prerequisite
Category:	sequential
Requisite course(s): List both prerequisites and corequisites in this box.	Anatomy-32 AND Chemistry-20 or Chemistry-21A or Chemistry-4
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	<p>Use scientific terminology. ANAT 32 -Apply appropriate terminology such as directional terms and regional terms to various anatomical features.</p> <p>Name and write chemical formulas for inorganic compounds: binary non-metals compounds, salts and acids.</p>

	<p>CHEM 4 -Utilize the language of chemistry, including vocabulary, symbols, formulas, and equations.</p> <p>CHEM 20 -Use chemical terminology to name inorganic chemical compounds, formulas and reactions and classify types of chemical reactions. Perform stoichiometric calculations involving chemical reactions.</p> <p>Write and classify chemical equations for elementary chemical reactions. CHEM 4 -Utilize the language of chemistry, including vocabulary, symbols, formulas, and equations.</p> <p>CHEM 21A - Use the language of general chemistry (vocabulary, nomenclature, formulas and equations) to describe chemical systems and changes (physical and chemical) they undergo.</p> <p>Perform stoichiometric calculations involving chemical reactions. CHEM 21A - Use the language of general chemistry (vocabulary, nomenclature, formulas and equations) to describe chemical systems and changes (physical and chemical) they undergo.</p> <p>CHEM 4 -Analyze and solve quantitative problems, including stoichiometry, percent yield, energy and change of temperature, gas laws, the ideal gas equation, Dalton's law of partial pressures, percent abundance of isotopes, density, solution concentration, and colligative properties.</p> <p>Write acid-base reactions. CHEM 20 -Compare and contrast Arrhenius and Bronsted-Lowry acid theories. Write acid-base reactions and determine the pH of aqueous solutions. Demonstrate an understanding of how a buffer works.</p> <p>CHEM 21A - State the properties and definitions of acids and bases and interpret elementary acid-base equilibria.</p> <p>Understand the basic structures and functional processes of the body systems. ANAT 32 -Identify cellular structures, organelles, and tissue types for all human organ systems.</p> <p>ANAT 32 -Identify the major anatomical structures for the major organ systems of the human body including integumentary, musculoskeletal, nervous, endocrine, digestive, circulatory, respiratory, urinary, and reproductive systems.</p>
Requisite:	
Requisite and Matching Skill(s): Bold the requisite skill(s). If applicable	
Requisite course:	
Requisite and Matching skill(s): Bold	

the requisite skill. List the corresponding course objective under each skill(s).	
Requisite:	
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable	
Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Jim Rozolis/P. Mel
Date:	04/01/1962
Original Board Approval Date:	
Last Reviewed and/or Revised by:	Thanh-Thuy Bui
Date:	05/24/2021
Last Board Approval Date:	07/19/2021