GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: BIO 9 DIVISION: 10 ALSO LISTED AS:

TERM EFFECTIVE: Fall 2021 CURRICULUM APPROVAL DATE: 6/8/2021

SHORT TITLE: HUMAN PHYSIOLOGY

LONG TITLE: Human Physiology

Units	Number of Weeks	Type	Contact Hours/Week	Total Contact Hours
5	18	Lecture:	4	72
		Lab:	3	54
		Other:	0	0
		Total:	7	126

Out of Class Hrs:	144.00
Total Learning Hrs:	270.00

COURSE DESCRIPTION:

Study of the physiological principles, function, integration and homeostasis of the human body at the cellular, tissue, organ, organ system and organism level: integumentary system, bone, skeletal, smooth and cardiac muscles, nervous system, sensory organs, cardiovascular system, lymphatic and immune systems, respiratory system, urinary system, endocrine system, and reproductive system. (C-ID: BIOL 120B) PREREQUISITE: CHEM 30A, BIO 7 or 15 or AH 15 with a grade of 'C' or better. ADVISORY: CHEM 30B; high school-level reading and writing skills.

PREREQUISITES:

(Completion of BIO 7, as UG, with a grade of C or better.
OR
Completion of BIO 15, as UG, with a grade of C or better.
OR
Completion of AH 15, as UG, with a grade of C or better.)
AND Completion of CHEM 30A, as UG, with a grade of C or better.

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

- 02 - Lecture and/or discussion
- 03 - Lecture/Laboratory
- 04 - Laboratory/Studio/Activity
- 04B - Laboratory - LEH 0.75
- 05 - Hybrid
- 71 - Dist. Ed Internet Simultaneous
- 72 - Dist. Ed Internet Delayed
- 73 - Dist. Ed Internet Delayed LAB
- 73B - Dist. Ed Internet LAB-LEH 0.75

STUDENT LEARNING OUTCOMES:

By the end of this course, a student should:

1. Describe key functional features of different types of human cells and how they communicate.
2. Identify key functions and structures of major organ systems and explain the physiological mechanisms underlying their operation.
3. Integrate knowledge of basic chemistry and physical laws to explain the physiology of human cells, tissues, organs, and organ systems.
4. Describe how homeostasis is maintained in the body.
5. Explain physiological principles by following the scientific method in the analysis of experimental design and data.

COURSE CONTENT:

Curriculum Approval Date: 6/8/2021

LECTURE CONTENT:

4 LEC HOURS

INTRODUCTION, HOMEOSTASIS

Objectives:

1. Define the term homeostasis and explain its importance to human physiology.
2. Discuss levels of organization in biology and apply this concept to physiology.
3. Discuss negative and positive feedback and their relationship to homeostasis.
4. Discuss the scientific method and its application to human physiology.

Assignments: Read text. Answer homework questions.

4 LEC HOURS

BASIC CHEMISTRY

Objectives:

1. Explain why an understanding of chemistry is essential to the understanding of human physiology.
2. Define and discuss; atom, molecule, compound, isotope, isomer.
3. Describe atomic structure and its relationship to chemical bonding.
4. Discuss the different types of chemical bonds.
5. Define and discuss the following and their relationship to human physiology: acid, base, salt, buffer, pH scale.
6. List the major inorganic and organic constituents of the body.
7. Discuss dehydration synthesis, hydrolysis and relate these processes to subunits and macromolecules.
8. Describe and discuss the importance of the four groups of macromolecules: carbohydrates, proteins, lipids, nucleotides and nucleic acids.

Assignments: Read text. Answer homework questions.

6 LEC HOURS

CELL STRUCTURE AND FUNCTION

Objectives:

1. Describe the structure and functions of cell membranes.
2. Describe the chemical composition, structure and functions of animal cell organelles, cellular inclusions and extracellular materials.
3. Discuss the cell cycle and its regulation.
4. Compare and contrast mitosis and meiosis.
5. Define the roles of DNA and RNA in protein synthesis.
6. Discuss control of transcription and translation.
7. Discuss the relationship between aging, cancer and the cell cycle.

Assignments: Read text. Answer homework questions.

COURSE CONTENT (CONTINUED):
LECTURE CONTENT (CONTINUED):
4 LEC HOURS
CELLULAR METABOLISM
Objectives:
1. Discuss the Laws of Thermodynamics and their relationship to cellular metabolism.
2. Describe the role of enzymes in cell metabolism.
3. Discuss the chemical makeup of ATP, ADP, cAMP, NAD, and FAD and their roles in cellular metabolism.
4. Define: catabolism, anabolism.
5. Discuss glycolysis, Krebs cycle and the electron system and relative ATP production.
6. Describe lactic acid production and the Cori cycle.
7. Discuss glycogenesis, gluconeogenesis and glycgenolysis.
8. Describe the chemiosmotic theory of ATP generation.
9. Discuss the catabolism of proteins and lipids.
10. Discuss the relationship between catabolism and anabolism of carbohydrates, proteins and lipids.
11. Define the terms anaerobic, aerobic and maximal oxygen uptake.
12. Define the term oxygen debt and explain the factors that contribute to it.
13. Discuss the relationship between diabetes and cellular metabolism.
Assignments: Read text. Answer homework questions.
4 LEC HOURS
MEMBRANE TRANSPORT
Objectives:
1. Discuss processes of membrane transport and explain how they are affected by factors such as concentration, chemical composition, etc.
2. Differentiate between carrier- mediated and non carrier mediated transport.
3. Discuss the Na+/K+ pump and its functions.
4. Discuss coupled or co-transport.
5. Describe the membrane potential, explain how it is established and the factors that can affect it.
Assignments: Read text. Answer homework questions.
4 LEC HOURS
NERVOUS SYSTEM: GENERAL FUNCTIONS AND CNS
Objectives:
1. Discuss and explain the action potential.
2. Discuss the "all or none" law of neurophysiology.
3. Define and discuss: threshold, subthreshold, spatial and temporal summation.
4. Compare and contrast graded and action potentials.
5. Discuss coding of stimulus intensity.
6. Discuss impulse conduction in neurons.
7. Compare and contrast electrical and chemical synapses.
8. Define and discuss EPSPs and IPSPs.
9. List and describe the action of known and potential neurotransmitters.
10. Discuss the integration of EPSPs, IPSPs, summation and the action of neuromodulators.
11. Describe the major parts of the brain and the functions controlled by each part.
12. Discuss the process of memory consolidation.
13. Discuss the roles of the spinal cord in reflex and integration.
14. Discuss spinal cord tracts.
Assignments: Read text. Answer homework questions.

COURSE CONTENT (CONTINUED):

LECTURE CONTENT (CONTINUED):

4 LEC HOURS

AUTONOMIC NERVOUS SYSTEM

Objectives:

1. List, describe and discuss the effectors of the ANS.
2. Compare and contrast the parasympathetic and sympathetic divisions.
3. Explain the relationship of the adrenal glands and the ANS.
4. List and discuss the neurotransmitters of the ANS.
5. Discuss adrenergic (alpha and beta) and cholinergic (muscarinic and nicotinic) receptors and the responses at different receptors.
6. Discuss dual innervation.
7. Discuss the role of the CNS in control of the ANS.

Assignments: Read text. Answer homework questions.

4 LEC HOURS

SENSORY PHYSIOLOGY

Objectives:

1. Compare and contrast the different categories of sensory receptors.
2. Describe the Law of Specific Nerve Energies and its relationship to sensations.
3. Discuss factors affecting perception including, but not limited: sensory adaptation, tonic and phasic receptors, receptor potentials, receptive field, lateral inhibition.
4. Discuss the structures and processes responsible for equilibrium.
5. Discuss the structures and process responsible for hearing.
6. Describe the structures of the eye and their relationship to vision.
7. Discuss the processes responsible for vision.
8. Discuss the roles of the rods and cones and the visual pigments.
9. Discuss the tectal system and control of visual movements.
10. Discuss visual processing.
11. Describe the neural pathways for all senses, including but not limited to: equilibrium, hearing, vision.

Assignments: Read text. Answer homework questions.

4 LEC HOURS

MUSCULAR CONTROL

Objectives:

1. Describe the gross and microscopic structure of skeletal muscle and discuss the relationship between structure and function.
2. Explain the sliding filament theory of muscle control.
3. Explain excitation-contraction coupling.
4. Discuss energy supply and energy use by skeletal muscle.
5. Compare and contrast slow, intermediate and fast twitch muscle fibers.
6. Discuss control of strength of contraction.
7. Define and describe twitch, summation and tetanus.
8. Discuss the terms motor unit, series elastic component.
9. Discuss lower and upper motor control.
10. Compare and contrast pyramidal and extrapyramidal tracts.
11. Explain the roles of the brain in motor neuron control.
12. Compare and contrast structure and contraction in skeletal, smooth and cardiac muscle.

Assignments: Read text. Answer homework questions.

COURSE CONTENT (CONTINUED):

LECTURE CONTENT (CONTINUED):

6 LEC HOURS

CARDIOVASCULAR SYSTEM

Objectives:

1. Describe the composition and functions of blood.
2. Describe the blood clotting pathway.
3. Describe the functional anatomy of the heart. Follow the pathway of blood through the heart.
4. Describe the events of the cardiac cycle.
5. Discuss how the unique properties of cardiac muscle tissue are essential to normal cardiac function.
6. Discuss electrical conduction in the heart.
7. Describe the waves of the ECG and explain their correlation to the events of the cardiac cycle, pressure changes in the heart, valve closures and heart sounds.
8. Discuss the diagnostic value of the ECG and heart sounds.
9. Define and describe arrhythmias detected by the ECG.
10. Define and describe heart blocks.
11. Compare the structure and function of the different types of blood vessels.
12. Discuss the roles of HDL and LDL in cholesterol metabolism and transport.
13. Define cardiac output and discuss the factors controlling it.
14. Discuss regulation of cardiac rate, stroke volume.
15. Define and discuss EDV, MAP, Frank-Starling Law of the heart, intrinsic and extrinsic control of blood vessel diameter, total peripheral resistance, baroreceptor reflex.
16. Discuss and explain regulation of blood volume.
17. Discuss regulation of blood flow to different organ systems.
18. Discuss selected disorders of the cardiovascular system.

Assignments: Read text. Answer homework questions.

COURSE CONTENT (CONTINUED):

LECTURE CONTENT (CONTINUED):

4 LEC HOURS

RESPIRATORY SYSTEM

Objectives:

1. Describe the major structures of the respiratory system and discuss their relationship to function.
2. Define intrapulmonary, intrapleural, transpulmonary and intrathoracic pressures and explain how Boyle's Gas Law affects these.
3. Define compliance, elasticity, surface tension and explain how these are important to lung function.
4. Explain the role of surfactant.
5. Describe lung volumes and their diagnostic value.
6. Explain Dalton's Law and its relationship to gas exchanges.
7. Differentiate between total blood oxygen and dissolved oxygen.
8. Define discuss ventilation-perfusion ratio.
9. Discuss the control of ventilation.
10. Describe and discuss hemoglobin and its various forms.
11. Discuss loading and unloading reactions.
12. Describe the oxygen dissociation curve and diagram it in graph.
13. Describe the different factors that affect oxygen and carbon dioxide transport in the blood.
14. Discuss the role of carbon dioxide in maintenance of blood pH.
15. Explain chloride shift and reverse chloride shift.
16. Define and discuss respiratory and metabolic acidosis and alkalosis.
17. Describe adjustments to ventilation during exercise and the effects of endurance on the anaerobic threshold.
18. Discuss the effects of high altitude and compensatory changes of the body.
19. Discuss selected disorders of the respiratory system.

Assignments: Read text. Answer homework questions.

COURSE CONTENT (CONTINUED):

LECTURE CONTENT (CONTINUED):

4 LEC HOURS

KIDNEY PHYSIOLOGY

Objectives:

1. Describe the relationship between the structure and functions of the urinary system.
2. Describe the histology of the kidney and explain the relationship between the structure and function of the nephron.
3. Discuss the basic processes of urine formation.
4. Discuss the factors that determine net filtration pressure.
5. Compare and contrast the composition of plasma, filtrate and urine.
6. Define and discuss glomerular filtration rate.
7. Describe and explain the counter current multiplier mechanism.
8. Discuss the effects and the control of secretion of ADH, aldosterone and other factors involved in the control of urine production and composition.
9. Define and discuss renal plasma threshold, transport maximum.
10. Discuss the reabsorption of urea and its role in the counter current multiplier mechanism.
11. Discuss the relationship between Na+, K+ and H+.
12. Discuss the role of the kidney in maintenance of acid-base balance.
13. Discuss the importance of urinary buffers.
14. Describe the actions of various diuretics.
15. Discuss the reabsorption and secretion of various substances.
16. Discuss various tests of renal function and their diagnostic significance.
17. Describe and discuss selected disorders of the urinary system.
18. Define and discuss the control of micturition.

Assignments: Read text. Answer homework questions.

6 LEC HOURS

ENDOCRINE SYSTEM

Objectives:

1. Describe the general mechanism of hormone function; discuss the importance of the concept target tissues in hormone function.
2. Discuss the chemical classification of hormones.
3. Discuss hormone interactions.
4. Discuss the general mechanism of action of steroid hormones and thyroid hormones.
5. Discuss the general mechanism of amine, polypeptide and glycoprotein hormones.
6. Describe the role of second messengers in hormone action.
7. List the major endocrine glands, the hormones that they secrete and the functions of the hormones.
8. Discuss the regulation of hormone secretion and hormone action.
9. Define and discuss disorders of the endocrine system.
10. Describe prostaglandins and discuss their roles.

Assignments: Read text. Answer homework questions.

COURSE CONTENT (CONTINUED):

LECTURE CONTENT (CONTINUED):

4 LEC HOURS

DIGESTIVE SYSTEM AND METABOLIC REGULATION

Objectives:

1. Be able to follow a protein, carbohydrate, or lipid through the digestive tract and explain how and where it is digested and absorbed.

2. Discuss the secretions of digestive tract glands and organs and the reabsorption of water throughout the digestive tract.

3. Discuss the functions of the liver, pancreas, gall bladder and other accessory structures of the digestive tract.

4. Discuss control of secretions and smooth muscle contractions in the digestive (GI) tract.

5. Describe hepatic blood flow and the formation of bile. Define enterohepatic circulation and the conversion of hemoglobin to bilirubin and urobilinogen.

6. Discuss the excretion of wastes by the GI tract and the formation of feces.

7. Discuss selected disorders of the GI tract.

8. Discuss how insulin, glucagon, epinephrine, glucocorticoids, growth hormone, thyroxine and other hormones balance metabolic activities.

9. Discuss diabetes and its causes, its forms and its effects.

10. Discuss other selected metabolic disorders.

11. Describe how calcium and phosphate levels are regulated.

Assignments: Read text. Answer homework questions.

4 LEC HOURS

IMMUNE SYSTEM

Objectives:

1. Differentiate between specific and non-specific immunity.

2. Discuss and describe the main components of non-specific immunity.

3. Define and discuss: antigen, antibody, hapten.

4. Explain the roles of B cells, T cells and APC in specific immunity.

5. Describe a generalized immunoglobulin molecule and describe the major characteristics of the different immunoglobulin classes.

6. Explain the relationship between the specific and non-specific immune responses.

7. Be able to explain and follow the events of the specific immune response beginning with the introduction of an antigen into the body.

8. Compare and contrast the primary and secondary immune response.

9. Compare and contrast naturally and artificially acquired active and passive immunity.

10. Discuss immune tolerance and recognition of "self" antigens.

11. Define and discuss the importance of histocompatibility antigens.

12. Discuss autoimmune diseases and list examples.

13. Describe the ABO and Rh blood typing systems and transfusion reactions.

14. Discuss transplant rejection.

15. Discuss the different types of hypersensitivity reactions.

Assignments: Read text. Answer homework questions.

COURSE CONTENT (CONTINUED):

LECTURE CONTENT (CONTINUED):

4 LEC HOURS

REPRODUCTIVE SYSTEM AND DEVELOPMENT

Objectives:

1. Discuss sex determination and development of genitalia in the embryo.
2. Describe the processes of oogenesis and spermatogenesis and their regulation.
3. Compare and contrast spermatogenesis and spermiogenesis.
4. Discuss oogenesis and ovulation and their regulation.
5. Describe the events of the menstrual cycle and their control.
6. Describe the events of intercourse and their control.
7. Discuss fertilization, implantation and the development of the placenta.
8. Discuss the role of hormones in the maintenance of the endometrium.
9. Describe the embryonic membranes.
10. Describe the early embryonic stages of the human embryo and compare them to other vertebrate embryos.

Assignments: Read text. Answer homework questions.

2 LEC HOURS

FINAL EXAM

COURSE CONTENT (CONTINUED):

LAB CONTENT:

3 LAB HOURS

LAB SAFETY, MICROSCOPE USE

Objectives:

1. Identify the parts of a compound light microscope, discuss their functions, and become familiar with its basic operation.

2. Use a microscope at scanning through high power objectives.

3. Discuss rules for proper use of a microscope.

4. Estimate the size of objects viewed through the microscope.

5. Define the following metric prefixes and be able to interconvert metric prefixes: mega, kilo, deka, deci, centi, milli, micro.

6. Examine prepared slides under the microscope: the letter e, millimeter slide rule, silk threads.

Assignments: Answer lab report questions regarding proper microscope usage and metric system unit conversions.

3 LAB HOURS

HOMEOSTASIS

Objectives:

1. Define the term Homeostasis.

2. Explain how the negative feedback control of effectors helps to maintain homeostasis.

3. Explain why the internal environment is in a state of dynamic, rather than static, constancy.

4. Define the terms set point and sensitivity.

5. Explain how a normal range of values for temperature or heart rate is obtained, and discuss the significance of these values.

6. As an example of maintaining homeostasis, measure pulse before and after physical activity. Plot data points to make a graph showing negative feedback, and compare data to those of other classmates.

7. Describe how average values and normal range values are determined and explain the difference between average and normal values.

Assignments: Answer lab report questions regarding homeostasis, negative feedback mechanisms, and normal ranges versus average.

3 LAB HOURS

pH AND BUFFERS

Objectives:

1. Define pH and discuss its importance to physiological processes.

2. Define acid and base.

3. Discuss the pH scale and its meaning.

4. Describe the different methods for determining pH and their relative merits.

5. Define acidosis and alkalosis.

6. Define the term buffer and describe the role of buffers in physiological processes.

7. Define: association, dissociation.

8. Describe the bicarbonate buffer system, and be able to write the chemical equations illustrating the role of the bicarbonate buffer system with the addition of a strong acid or a strong base.

9. Measure pH values of various solutions (household items plus buffered phosphate solutions) using pH paper and a pH electrode. Compare with values obtained by other classmates.

10. Measure buffering capacity of various solutions (albumin, water, phosphate buffer) by acid titration.

Assignments: Answer lab report questions regarding the pH scale and maintaining pH in the body.

COURSE CONTENT (CONTINUED):

LAB CONTENT (CONTINUED):

3 LAB HOURS

SPECTROPHOTOMETRY

Objectives:

1. Discuss the uses of the spectrophotometer.

2. Describe the basic principles of operation of the spectrophotometer (including Beer's Law).

3. Perform a serial dilution.

4. Graph absorbance vs. concentration, and determine the concentration of an unknown solution.

5. Define homeostasis.

6. Discuss why fluctuation of values suggests homeostasis (dynamic rather than static constancy).

7. Measure solute concentration of prepared serial dilution samples and generate a standard curve to be used in estimating solute concentration of samples of unknown concentration.

Assignments: Answer lab report questions regarding proper operation of a spectrophotometer, concepts illustrating how spectrophotometers work, and generating a standard curve.

3 LAB HOURS

CELLULAR METABOLISM

Objectives:

1. Discuss the relationship between temperature, activity level and oxygen consumption in animals.

2. Discuss the relationship between respiration rate and oxygen consumption in animals.

3. Discuss the principles of the closed manometer and its potential experimental applications.

4. Discuss the relationship between activity level and carbon dioxide production in animals.

5. Describe the role of carbon dioxide in maintenance of blood acid base levels.

6. Give the equations describing glucose oxidation and the formation of carbonic acid from carbon dioxide and water.

7. Define the term indicator and discuss the importance and possible applications of indicators in experiments.

8. Set up manometer with mouse to measure oxygen consumption at two different temperatures.

9. Perform a set of calculations to determine the amount of oxygen used per unit mass of mouse, per unit time.

Assignments: Answer lab report questions regarding oxygen use at different temperatures, and the relationship between metabolism (i.e. energy production) and oxygen use.

3 LAB HOURS

MEMBRANE TRANSPORT

Objectives:

1. Define: diffusion, osmosis, osmolality, molarity, molality, hypertonic, hypotonic, isotonic.

2. Compare solubility of polar vs. nonpolar compounds in polar vs. nonpolar solvents and explain the importance of this concept to cell transport.

3. Describe the role of detergents in transport.

4. Differentiate between molality and osmolality and discuss how ionization of a compound effects the tonicity of a solution.

5. Differentiate between percent solutions and molar or molal solutions.

6. Discuss the clinical/physiological importance of osmosis and diffusion.

7. Prepare a mixture of polar and non-polar substances to learn about miscibility.

8. Observe the effects of osmosis across an animal membrane over time by measuring the mass of an egg submerged in water.

9. Observe effects of cells in hypo-, hyper-, and isotonic environments.

Assignments: Answer lab report questions regarding tonicity, miscibility, and osmosis.

COURSE CONTENT (CONTINUED):

LAB CONTENT (CONTINUED):

3 LAB HOURS

REFLEX ARCS AND NEURAL FUNCTION

Objectives:

1. Define the term reflex arc, and list the general components of a reflex arc.

2. Describe the structure and function of muscle spindles.

3. Describe a simple stretch reflex test and discuss the diagnostic significance of testing stretch reflexes.

4. Describe the Babinski reflex test and discuss the diagnostic significance of the Babinski test.

5. Use the Lab Tutor computer system to quantify latent period and time to maximal response for the knee jerk reflex.

6. Use the Lab Tutor computer system to quantify stimulus response (latent period and degree of rotation) for the knee jerk reflex. 7.Use Lab Tutor computer system to demonstrate neurological facilitation and antagonistic dampening.

8.Use the Lab Tutor computer system to demonstrate the difference between a cognitive response and a reflex response. Assignments: Answer lab report questions regarding reflex arcs and the Lab Tutor software.

3 LAB HOURS

SENSORY PHYSIOLOGY: CUTANEOUS RECEPTORS

Objectives:

1. Define punctate distribution, projection, phantom pain.

2. Discuss the phenomenon of sensory adaptation.

3. Define and discuss the two point threshold and describe where on the two point threshold is different and why.

4. Discuss the phenomenon of referred pain and how it can be important in diagnosis.

5. Define the Law of Specific Nerve Energies and explain its significance.

Assignments: Answer lab report questions regarding sensory adaptation, two-point thresholds, and punctate distribution.

3 LAB HOURS

SENSORY PHYSIOLOGY: HEARING

Objectives:

1. Describe the structures of the ear as they relate to the function of hearing and equilibrium.

2. Perform the Rinne and Weber's tests and discuss their diagnostic significance.

3. Compare and contrast sensory and conduction deafness.

4. Discuss how sounds of low and high pitches are localized.

5. Define vertigo and discuss its etiology.

6. Describe vestibular nystagmus and discuss its etiology.

Assignments: Answer lab report questions regarding conduction and sensory deafness, binaural sound localization, and equilibrium.

COURSE CONTENT (CONTINUED):

LAB CONTENT (CONTINUED):

3 LAB HOURS

SENSORY PHYSIOLOGY: VISION

Objectives:

1. Describe the gross structure of the eye and its major function.
2. Describe the pupillary reflex and explain why it occurs.
3. Describe tests that test for astigmatism and visual acuity.
4. Discuss the process of accommodation; define the term presbyopia and discuss why it occurs.
5. Demonstrate the blind spot and explain why there is a blind spot.
6. Describe positive and negative afterimage formation and discuss why they occur, both for black and white and for color vision.
7. Define the terms retinal disparity and convergence and discuss their significance.
8. Explain what is meant by the term visual processing and give examples.
9. Define the terms nystagmus and strabismus.

Assignments: Answer lab report questions regarding the pupillary reflex, accommodation, blind spots, afterimages, and visual processing.

3 LAB HOURS

MUSCLE PHYSIOLOGY

Objectives:

1. Describe how an EMG can be used to demonstrate the electrical activity of a muscle.
2. Discuss the antagonistic action of the biceps brachii and the triceps brachii as demonstrated by the EMG.
3. Discuss how the EMG could be used in biofeedback exercises.
4. Describe the process of muscular contraction at a cellular level.
5. Discuss the roles of the following in muscular contraction: ATP, Ca++, Na+.
6. Explain the roles of Mg++ and K+ in the muscular contraction experiment.
7. Discuss the following aspects of muscle physiology: threshold stimulus, spatial summation, latent period.

Assignments: Answer lab report questions regarding EMG traces and the effect of ATP and salt on muscle contraction.

3 LAB HOURS

CARDIOVASCULAR SYSTEM

Objectives:

1. Describe the gross structure and conducting system of the heart.
2. Describe the flow of blood through the heart.
3. Use the Lab Tutor program to obtain and analyze an ECG.
4. Demonstrate how to listen for heart sounds.
5. Discuss the relationship between the ECG, cardiac cycle and heart sounds.
6. Discuss the effects of exercise on the ECG and the cardiac cycle.
7. Discuss the diagnostic value of heart sounds and the ECG.
8. Demonstrate how to obtain a blood pressure reading using a sphygmomanometer and a stethoscope.
9. Define the term hypertension and discuss its significance.
10. Define the terms systolic, diastolic, pulse pressure and mean arterial pressure.
11. Discuss the relationship between position of the body and blood pressure.
14. List factors that control heart rate before, during and after exercise.
15. List factors that control blood flow to tissues before, during and after exercise.

Assignments: Answer lab report questions regarding the components of an ECG, heart sounds, and blood pressure measurements.

COURSE CONTENT (CONTINUED):

LAB CONTENT (CONTINUED):

3 LAB HOURS

RESPIRATORY SYSTEM

Objectives:

1. Describe the gross structure of the respiratory system.

2. Describe the mechanics of breathing.

3. Define the following terms and explain their value in assessing lung health: tidal volume, vital capacity, expiratory reserve, inspiratory reserve, total lung capacity, inspiratory capacity.

4. Define residual lung volume and functional residual capacity and discuss their significance.

5. Define total minute volume and forced expiratory reserve volume and explain their diagnostic value.

6. Compare restrictive and obstructive pulmonary disorders and discuss how pulmonary function tests would differ in each disorder.

7. Discuss factors other than disease that can affect lung volumes.

Assignments: Answer lab report questions regarding respiratory volumes.

3 LAB HOURS

KIDNEY PHYSIOLOGY

Objectives:

1. Describe the gross structure of the urinary system.

2. Discuss process by which urine formation occurs.

3. Discuss why urinalysis is an important diagnostic tool.

4. Describe the different diseases that may cause abnormal appearance or chemical composition of urine.

5. Describe normal and abnormal constituents of urine sediment, and how analysis of urine sediment can be valuable in diagnosis.

6. Discuss how ingestion of salt, water, glucose and caffeine will affect urine volume and composition.

7. Discuss the roles of ADH and the renin angiostensin aldosterone system in the control of urine volume and composition. Assignments: Answer lab report questions regarding properties of urine.

3 LAB HOURS

EMBRYOLOGY

Objectives:

1. Describe the processes of cleavage and gastrulation.

2. Define the following terms; organogenesis, morula, blastula, gastrula, blastopore.

3. Discuss the significance of germ layer formation.

4. Describe endoderm, mesoderm and ectoderm, and the structures that arise from them.

5. Identify the following structures on a chick embryo; allantois, heart, limb buds, brain, neural tube, somites, eye, vitelline blood vessels.

Assignments: Answer lab report questions regarding the stages of embryological development and structures that arise from them.

COURSE CONTENT (CONTINUED):

LAB CONTENT (CONTINUED):

3 LAB HOURS

DIGESTION AND NUTRITION

Objectives:

1. Examine the effects of the presence of enzymes, variable pH, and high temperatures on the digestion of starch (a polysaccharide) into maltose (a disaccharide) using salivary amylase.

2. Examine the effects of the presence of enzymes, variable pH, and high temperatures on the digestion of proteins.

3. Describe physical factors that may aide in digestion.

4. Define zymogens.

5. Describe the process of emulsification of fats, the organs involved and enzymes/hormones required for digestion of fats.

6. Identify the major enzymes and hormones involved in digestion, their origin, target molecule, products produced and where digestion occurs.

Assignments: Answer lab report questions regarding protein digestion, carbohydrate digestion and fat digestion.

3 LAB HOURS

BLOOD TYPING

Objectives:

1. Define agglutinogen and agglutinin.

2. Perform an actual blood typing procedure.

3. Observe the antigen/antibody reaction in simulated blood.

4. Determine the ABO and Rh blood type of four unknown samples.

5. Determine the ABO and Rh blood types of simulated blood samples.

6. Review terms such as hematocrit, hemoglobin content, and conditions such as hemophilia, anemia, pernicious anemia, aplastic anemia, iron deficiency anemia.

Assignments: Answer lab report questions blood transfusion reactions scenarios (hematocrit, hemoglobin, anemia), best candidate for universal donor or universal recipient, the causes of erythroblastosis fetalis.

3 LAB HOURS

FERTILIZATION

Objectives:

1. Describe the structure and function of the major tissues of the ovaries and testes in humans.

2. Describe the processes of spermatogenesis and oogenesis.

3. Describe the process of and necessary conditions for fertilization.

4. Obtain gametes from sea urchins and observe the initial stages of zygote development.

Assignments: Answer lab report questions regarding the spermatogenesis/oogenesis and factors that may affect the process and the viability of sperm/ova and the success of conception.

METHODS OF INSTRUCTION:
Lecture and laboratory instruction, supplemental with audiovisual aids, computer demonstrations, analyses and simulations.

OUT OF CLASS ASSIGNMENTS:
Required Outside Hours: 20
Assignment Description:
Written homework, case studies

Required Outside Hours: 24
Assignment Description:
Lab reports

Required Outside Hours: 100
Assignment Description:
Reading, review, and recitation

METHODS OF EVALUATION:
Writing assignments
Percent of total grade: 25.00 %
Percent range of total grade: 20 % to 35 % Written Homework Essay Exams Other: quizzes

Problem-solving assignments
Percent of total grade: 25.00 %
Percent range of total grade: 20 % to 30 % Homework Problems Lab Reports Quizzes

Objective examinations
Percent of total grade: 50.00 %
Percent range of total grade: 35 % to 60 % Multiple Choice True/False Matching Items

REPRESENTATIVE TEXTBOOKS:
Stuart Ira Fox. Human Physiology.. US: McGraw-Hill,2018.
ISBN: ISBN: 1259864626
Reading Level of Text, Grade: Reading level of text, Grade: 17 Verified by: Verified by: Microsoft
Required Other Texts and Materials
Yuh, McKenna, Brown, Keys. Bio 9 Lab Manual.

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B2, effective 202530

GAV B3, effective 202530

GAV Area 4 = Social & Behavior, effective 202530

CSU GE:

CSU B2, effective 202530

CSU B3, effective 202530

IGETC:

IGETC 5B, effective 202530

IGETC 5C, effective 202530

CSU TRANSFER:

Transferable CSU, effective 202530

Not Transferable

UC TRANSFER:

Transferable UC, effective 202530

Not Transferable

SUPPLEMENTAL DATA:

Basic Skills: N
Classification: Y
Noncredit Category: Y
Cooperative Education:
Program Status: 1 Program Applicable
Special Class Status: N
CAN: BIOL12
CAN Sequence: BIOL SEQ B
CSU Crosswalk Course Department: BIO
CSU Crosswalk Course Number: 120B
Prior to College Level: Y
Non Credit Enhanced Funding: N
Funding Agency Code: Y
In-Service: N
Occupational Course: E
Maximum Hours: 5
Minimum Hours: 5
Course Control Number: CCC000230885
Sports/Physical Education Course: N
Taxonomy of Program: 041000