BIO 327 Human Physiology  
Spring 2018
TR 9:30 – 10:45 Miller Science 137

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Phone: 468-2168
* All contact via e-mail should be professional in manner with proper punctuation and grammar.

Office Hours: S202
T 9:00 - 12:00  
F 10:00 – 12:00

Text and Materials
**Required:** Pearson’s Modified Mastering with Learning Catalytics
**Recommended:** Human Physiology: An Integrative Approach  
7th Edition by Dee, Unglaub and Silverthorn

Course Requirements:
Class Participation  
Mastering Biology Homework  
4 Major Exams

*You must score 100% on the syllabus quiz to unlock the course material on D2L!*

Course Content (Tentative Schedule):

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Chapter</th>
<th>Topic</th>
<th>Date</th>
<th>Exam</th>
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<tbody>
<tr>
<td>1-4</td>
<td>1</td>
<td>An introduction to physiology and homeostasis</td>
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<td>3</td>
<td>Cells and Tissues</td>
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<td>Membrane Dynamics</td>
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<td>Cell-to-Cell Communication</td>
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<td>8</td>
<td>Neurons: Cellular and Network Properties</td>
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<td>9</td>
<td>The Central Nervous System</td>
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<td>11</td>
<td>The Peripheral Nervous System</td>
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<td>Feb 12</td>
<td>Exam 1</td>
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<td>4-7</td>
<td>12</td>
<td>Muscles</td>
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<td>14</td>
<td>Cardiovascular Physiology</td>
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<td>Blood Flow and Control of Blood Pressure</td>
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<td>Mar 5</td>
<td>Exam 2</td>
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<td>7-10</td>
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<td>Blood</td>
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<td>24</td>
<td>The Immune System</td>
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<td>Apr 4</td>
<td>Exam 3</td>
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<td>11-15</td>
<td>17</td>
<td>Mechanics of Breathing</td>
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<td>18</td>
<td>Gas Exchange and Transport</td>
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<td>19</td>
<td>The Kidneys</td>
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<td>21</td>
<td>The Digestive System</td>
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<td>26</td>
<td>Reproduction and Development</td>
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<td>May 2</td>
<td>Exam 4 (If necessary this may be given on Wednesday May 9 at 1:00 pm)</td>
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Grading Policy:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Class Participation</td>
<td>50 points</td>
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<tr>
<td>Mastering A&amp;P Homework</td>
<td>100 points</td>
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<tr>
<td>4 Major exams (100 points ea.)</td>
<td>400 points</td>
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<tr>
<td>TOTAL COURSE POINTS</td>
<td>550 points</td>
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<thead>
<tr>
<th>Grade</th>
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<tr>
<td>A</td>
<td>(90% to 100%)</td>
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<tr>
<td>B</td>
<td>(80% to 89%)</td>
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<tr>
<td>C</td>
<td>(70% to 79%)</td>
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<tr>
<td>D</td>
<td>(60% to 69%)</td>
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<tr>
<td>F</td>
<td>(less than 60%)</td>
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Class Participation:
Daily participation points are earned by answering each Learning Catalytics question in class. Participation points will also be awarded for watching pre-lecture videos throughout the semester. The percentage of total points earned will be multiplied by 50 to determine your total participation points. **Answering Learning Catalytics questions when you are not in class is considering cheating, and may result in a grade of F for the course.**

Pre-Lecture Videos:
Pre-lecture videos will be periodically posted to D2L. You are required to watch these videos prior to coming to class and this will also count toward your participation grade. You will be responsible for the material covered in these videos.

Mastering Homework:
Mastering assignments will be posted upon completion of new material and will be due in one week. The percentage of total points earned will be multiplied by 100 to determine your total homework points.

Exam Policy:
The four major exams will be held during the regular class period. Each exam will include a comprehensive portion worth 10% of the exam grade. Exams will be an assortment of short answer, fill-in-the-blank, multiple choice and true false questions. All personal belongings will be left at the front of the classroom during the exam. This includes hats, food, beverages, and cell phones. Students will not be allowed to leave the room for ANY REASON during the exam. After the first exam is completed, no one will be allowed to start the exam.

Attendance Policy:
Attendance will be taken by participation in Learning Catalytics sessions. **Students that fail to answer ALL questions will be counted absent for the entire class period.** Students will be allowed up to 6 absences (excused or unexcused). Students that exceed this maximum will no longer be eligible to make-up missed work.

Make-up Work:
Make-up work will only be given to students with University excused absences. Make-up work will not be given to students that have absences in excess of 6 days (excused or unexcused). Students **must provide notification within 48 hours of their return to classes** in order to receive make-up work. Make-up learning catalytics will be given throughout the semester and **must be submitted within 1 week** of the student's return to classes. Make-up exams will be given the week before finals. Students are responsible for scheduling a time to take the make-up exam during this week with Dr. Canterberry via email.

Academic Integrity:
Academic Integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations on an assigned exercise; and/or (3) helping or attempting to help another in the act of cheating or
plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one’s own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one’s paper without giving the author due credit.

Please read the complete policy at [http://www.sfasu.edu/policies/academic_integrity.asp](http://www.sfasu.edu/policies/academic_integrity.asp)

**ANY act of academic dishonesty will result in receiving a grade of F for the course and will be reported to the student’s dean.**

**Withheld Grades Semester Grades Policy:**
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.

**Students with disabilities:**
To obtain disability related accommodations and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, Room 325, 468-3004/468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided.

**Student Counseling Center:**
Rusk Building 3rd Floor
(936) 468-2401
Email: [counseling@sfasu.edu](mailto:counseling@sfasu.edu)
The Student Counseling Center is available free of charge to students and is staffed with professional therapists to meet a variety of needs. All interactions with the Student Counseling Center are guaranteed confidential. Licensed Counselors are available from 8:00a.m.-5:00p.m. Monday-Friday. The department is closed on certain holidays, Spring Break and Winter Break when the university is closed. If you are in need of assistance after hours or on the weekend please call: University Police: (936)468-2608 or MHMR Crisis Line: (800)392-8343. If the situation is life threatening please dial 911.

**Acceptable Student Behavior:**
Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy D-34.1). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

The following policies will be strictly enforced:
- Students are to arrive on time and stay for the entire class period. Those who miss Learning Catalytics questions or leave early will be counted as absent.
- Students are not to hold private side conversations
- Reading unrelated publications is not allowed.
- Students who behave in a disrespectful manner (towards the professor or classmates) will be given one warning via e-mail. Further disruptive behavior will result in the student being banned from the classroom for the remainder of the semester.

**Students who exhibit unacceptable classroom behavior will be dismissed from class and counted as absent.**

**Course Description:** This course is designed for advanced biology majors and pre-health professions students. While we will focus on learning the functioning systems of the body in a separate manner, while appreciating the integrated nature of the functional machine that is the human body. Three semester hours, three hours lecture per week. Functions of the major systems of the body. Not open to students who have received credit for BIO 238.

**Pre-requisite(s):**
Bio 130 with a minimum of a C  
Bio 133 with a minimum of a C

**Program Learning Outcomes:**
Each of the student learning outcomes listed below address the Biology Department Program Learning Outcome #1: Demonstrate a good knowledge base in biological concepts and be able to integrate knowledge with critical thinking skills to become problem solvers. Knowledge base will include: levels of complexity (molecular/cellular through population/communities/ecosystems); biological principles and processes.

**Course Objectives:**
- Provide students with an understanding of the integrative nature of the biological functions of the human body (i.e., homeostasis).
- Provide students with an understanding of the function of each organ system in the human body with the focus on the underlying biochemical mechanisms that create a particular function.
- Compare and contrast clinical abnormalities with normal physiological functions.

**Student Learning Outcomes (Course Competencies):**
Student understanding will be evaluated with comprehensive exams (i.e., multiple choice, short answer, and essay questions) surveying in detail the material to be mastered. Students who successfully complete human physiology will be able to:

**Homeostasis**
- Define homeostasis, and identify the components of negative feedback loops.
- Explain the role of antagonistic effectors in maintaining homeostasis, and the nature of positive feedback loops.
- Give examples of how negative feedback loops involving the nervous and endocrine systems help to maintain homeostasis.

**Transport Mechanisms**
- Describe the intracellular and extracellular compartments of the body.
- Identify the components of passive transport, and distinguish passive from active transport.
- Define diffusion and describe the factors that influence the rate of diffusion.
- Define osmosis, describe the conditions required for it to occur, and explain how osmosis relates to osmolality and osmotic pressure.
- Explain the nature and significance of hypotonic, isotonic, and hypertonic solutions.
- Describe the characteristics of carrier-mediated transport, and distinguish between simple diffusion, facilitated diffusion, and active transport.
- Explain the action and significance of the Ca2+ pump and the Na+/K+ pumps.

**Membrane Potential**
- Describe the equilibrium potentials for Na+ and K+
- Describe the membrane potential and explain how it is produced.
Neurons and Supporting Cells
- Describe the different types of neurons and supporting cells, and identify their functions.
- Identify the myelin sheath and describe how it is formed in the CNS and PNS.
- Describe the nature and significance of the blood-brain barrier.

Electrical Activity of Axons
- Step-by-step, explain how an action potential is produced.
- Describe the characteristics of action potentials and explain how they are conducted by unmyelinated and myelinated axons.
- Describe the structure and function of electrical and chemical synapses.
- Identify the nature of excitatory and inhibitory postsynaptic potentials.
- Explain how ligand-gated channels produce synaptic potentials, using the nicotinic ACh receptor as an example.
- Explain how G-protein-coupled channels produce synaptic potentials, using the muscarinic ACh receptor as an example.
- Describe the action and significance of acetylcholinesterase.
- Identify the monoamine neurotransmitters and explain how they are inactivated at the synapse.
- Identify two neural pathways in the brain that use dopamine as a neurotransmitter, and explain their significance.
- Explain the action and significance of GABA and glycine as inhibitory neurotransmitters.
- Describe some of the other categories of neurotransmitters in the CNS.

Synaptic Integration
- Explain the nature of spatial and temporal summation at the synapse.
- Describe long-term potentiation and depression, and explain the nature of postsynaptic and presynaptic inhibition.

Skeletal Muscles
- Describe the different levels of muscle structure, and the actions of skeletal muscles.
- Describe motor units, and explain the significance of recruitment of motor units.

Mechanisms of Contraction
- Describe the banding pattern of a myofibril, and how these bands change length during muscle contraction.
- Explain the cross-bridge cycle and the sliding filament theory of contraction.
- Explain excitation-contraction coupling in skeletal muscles.

Contractions of Skeletal Muscles
- Distinguish between the different types of muscle contractions.
- Identify the series elastic component, and explain the length-tension relationship in striated muscles.

Energy Requirements of Skeletal Muscles
- Distinguish the different types of skeletal muscle fibers.
- Describe aerobic capacity, lactate threshold, and muscle fatigue.

Neural Control of Skeletal Muscles
- Describe the components of monosynaptic muscle stretch reflexes, including the role of gamma motor neurons.
- Describe the effects of Golgi tendon organs.
- Explain reciprocal innervation of skeletal muscles.

Cardiac and Smooth Muscle
- Describe the characteristics of cardiac muscle and how these compare to those of skeletal muscle.
- Describe the structure of smooth muscle and explain how its contractions are regulated.

Divisions of the Autonomic Nervous System
- Describe the structure of the sympathetic and parasympathetic divisions of the autonomic system.
- Explain the relationships between the sympathetic division and the adrenal medulla.

Functions of the Autonomic Nervous System
- Identify the neurotransmitters of the sympathetic and parasympathetic divisions, and the hormone released by the adrenal medulla.
- Describe the effects of adrenergic stimulation on different organs, and identify the types of adrenergic receptors involved.
- Describe the effects of parasympathetic nerve regulation, and explain how atropine and related drugs affect this regulation.

Functions and Components of the Circulatory System
- Identify the functions and components of the circulatory system.
- Describe the relationship between interstitial fluid, plasma, and lymph.

Composition of the Blood
- Distinguish between the different formed elements of the blood.
- Describe the regulation of red and white blood cell production.
- Explain blood typing and blood clotting.

Structure of the Heart
- Describe the structure of the heart and its components.
- Distinguish between the systemic and the pulmonary circulation.

Cardiac Cycle and Heart Sounds
- Describe the different phases of the cardiac cycle.
- Relate the cardiac cycle to the production of the heart sounds.
Electrical Activity of the Heart and the Electrocardiogram (EKG)
• Describe the pacemaker potential and the myocardial action potential
• Describe the components of the ECG and their relationships to the cardiac cycle

Blood Vessels
• Compare the structure and function of arteries and veins, and the significance of the skeletal muscle pumps
• Describe the structures and functions of different types of capillaries

Atherosclerosis and Cardiac Arrhythmias
• Explain the causes and dangers of atherosclerosis
• Explain the cause and significance of angina pectoris
• Describe how different arrhythmias affect the ECG

Lymphatic System
• Explain how the lymph and lymphatic system relate to the blood and cardiovascular system
• Describe the function of lymph nodes and lymphatic organs

Defense Mechanisms
• Describe the different elements of the innate immune system
• Describe the nature of antigens, lymphocytes, and lymphoid organs
• Explain the events that occur in a local inflammation

Functions of B Lymphocytes
• Describe B lymphocytes and antibodies and explain how they function
• Describe the complement system and explain its functions

Functions of T Lymphocytes
• Identify the different T lymphocytes and their functions
• Explain how T cells become activated and how they function in immunity

Active and Passive Immunity
• Explain how active immunity is produced, using the clonal selection theory
• Explain how passive immunity is produced

Tumor Immunology
• Explain the relationship between the immune system and cancer

Diseases Caused by the Immune System
• Explain the nature of autoimmune diseases
• Explain immediate and delayed hypersensitivity

Cardiac Output
• Describe the extrinsic regulation of cardiac rate and contractility.
• Explain the relationship between stroke volume and venous return.
• Explain the Frank-Starling law of the heart.

Blood Volume
• Explain the forces that act in capillaries and how edema can be produced.
• Explain how the kidneys regulate blood volume, and the hormonal regulation of this process.

Vascular Resistance to Blood Flow
• Describe the factors that affect blood flow through vessels.

Blood Flow to the Heart, Skeletal Muscles, Brain and Skin
• Explain the mechanisms that regulate blood flow to the heart and skeletal muscles.
• Describe the circulatory changes that occur during exercise.
• Explain how blood flow to the brain is regulated.
• Explain how blood flow to the skin is regulated.

Blood Pressure
• Explain how blood pressure is regulated.
• Describe how blood pressure is measured.
• Describe the causes and dangers of hypertension.
• Describe the causes and dangers of circulatory shock.

The Respiratory System
• Describe the structures and functions of the conducting and respiratory zones of the lungs
• Describe the location and significance of the pleural membranes

Physical Aspects of Ventilation
• Explain how intrapleural and intrapulmonary pressures change during breathing
• Explain how lung compliance, elasticity, and surface tension affect breathing, and the significance of pulmonary surfactant

Mechanics of Breathing
• Explain how inspiration and expiration are accomplished
• Describe lung volumes and capacities, and explain how pulmonary function tests relate to pulmonary disorders

Gas Exchange in the Lungs
• Explain how partial gas pressures are calculated, and their significance in measurements of arterial blood gases
• Describe the factors that influence the partial pressure of blood gases and the total content of oxygen in the blood
Regulation of Breathing
• Explain how ventilation is regulated by the CNS
• Explain how blood gases and pH influence ventilation

Hemoglobin and Oxygen Transport
• Describe the changes in percent oxyhemoglobin as a function of arterial PO2 and explain how this relates to oxygen transport
• Describe the various conditions that influence the oxyhemoglobin dissociation curve and oxygen transport

Carbon Dioxide Transport
• Explain how carbon dioxide is transported by the blood
• Explain the relationship between blood levels of carbon dioxide and the blood pH

Acid-Base Balance in the Blood
• Describe the acid-base balance of the blood, and how it is influenced by the respiratory system

Structure and Function of the Kidneys
• Describe the gross and microscopic structure of the kidney
• Trace the flow of blood and filtrate through the kidney

Glomerular Filtration
• Describe glomerular filtration and the structures involved
• Explain the significance of the glomerular filtration rate and how it is regulated

Reabsorption of Salt and Water
• Describe the salt and water reabsorption properties of each nephron segment
• Explain the countercurrent multiplier system
• Explain how ADH acts to promote water reabsorption

Renal Plasma Clearance
• Explain how renal plasma clearance is affected by reabsorption and secretion, and how it is used to measure GFR and total renal blood flow
• Define transport maximum and renal plasma threshold, and explain their significance

Renal Control of Electrolyte and Acid-Base Balance
• Explain how the renal excretion and reabsorption of Na+, K+, and H+, is regulated by the renin-angiotensinaldosterone system
• Explain how the kidneys reabsorb bicarbonate, and how the kidneys contribute to the regulation of acid/base balance