Course Description
This is a rigorous course that is intended for higher-ability students who think they might pursue a career related to either human or veterinary medicine. Students will read from a college level text and will be introduced to material typically offered in a college level Anatomy and Physiology course. The course will be organized around the organ systems in the human body. A dissection will be a required part of this course.

Course Rationale
Knowing and understanding the Human Body is a life benefit for all students. Understanding of the human body can help direct health and maintenance of one's own body. Each organ system plays a role in maintaining homeostasis and is interrelated with the other organ systems. A deeper understanding of the human body allows students to understand the significance of the interrelatedness of its parts.

Enduring Understandings
How the body responds when conditions leave normal homeostatic ranges
Structural hierarchy of a human from cellular level up to organ system level
How substances are moved within the body and how the body moves from one place to another
How various organ systems are involved in receiving essential gases and nutrients and eliminating wastes

Board Approval Date
Board Approved 6/26/2014

Course Details

Unit: Anatomy/Physiology Basics  Duration: 2 Week(s)

Unit Overview
Anatomy utilizes basic terms and concepts to describe the organization of the human body.

Enduring Understandings
The body has regions with specific names used in anatomy and by medical professionals.
The location of parts of the body in relation to one another or directions on the body are described in anatomical terms.

Essential Questions
Why do scientists need a unified set of names to describe the regions of the body?
How can scientists effectively communicate the location of one part of the body in relation to the location of other areas?

Example Assessment Items
Given a human body diagram, students will be able to correctly identify body regions using appropriate anatomical vocabulary.

Topic: Disciplines in anatomy and physiology  Duration: 1 Day(s)

Learning Targets
The student will compare and contrast the terms anatomy, physiology, and pathology and use an example to explain how they are related.
HS Human Anatomy/ Physiology

Science

Grade(s) 10th - 12th, 1 Credit

Elective Course

<table>
<thead>
<tr>
<th>Topic: Body system overview</th>
<th>Duration: 2 Day(s)</th>
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**Learning Targets**
- The student will be able to match a set of organs with the system to which it belongs.
- The student will describe major functions of the body systems and their major organs.
- The student will draw a model of the human body depicting the body systems with their corresponding organs.

<table>
<thead>
<tr>
<th>Topic: Body regions</th>
<th>Duration: 1 Day(s)</th>
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</table>

**Learning Targets**
- The student will state the anatomic terms for the parts of the body.

<table>
<thead>
<tr>
<th>Topic: Anatomical directions/ dissection planes</th>
<th>Duration: 3 Day(s)</th>
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**Learning Targets**
- The student will use proper terminology to describe the location of body parts with respect to one another.
- The student will describe the anatomic position.

<table>
<thead>
<tr>
<th>Topic: Body cavities</th>
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**Learning Targets**
- The student will describe the cavity divisions throughout the body.
- The student will list the organs found in the body cavities.

**Unit: Structural Hierarchy**

**Unit Overview**
- Examination of the structures that form the foundation of the human body and allow for its various functions.

**Enduring Understandings**
- The hierarchy of organization of living things begins with the cell and ends with the organism.
- The human body is comprised of four basic tissue types.
- The human body has inside support and outside protection.

**Essential Questions**
- How is the human body organized starting with the cell?
- How are the four basic tissue types used to construct the body?
- How is the body protected from the outside environment?
- Why do humans need a skeletal system?

**Example Assessment Items**
- Given the levels of human body hierarchy organization then the student will put them in order.
- Given the function of a specific tissue the student will predict the tissue type.

**Academic Vocabulary**
- Tissues are groups of similar cells.
- The integumentary system offers the body protection from and information about the external environment.
- The skeletal system is important for movement and protection.
- The muscular systems is important for movement and maintaining a constant body temperature.

<table>
<thead>
<tr>
<th>Topic: The four tissue types</th>
<th>Duration: 10 Day(s)</th>
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**Description**
- Tissues and membranes are more complex than the individual cells of which they are made. Tissues contribute to the overall function and complexity of the organs and organ systems they are a part of.

**Learning Targets**
- The student describe the key differences between the four types of tissue.
- The student will classify all tissues as one of four tissue types.
- The student will recognize the the relationship between the structure of various types of epithelial tissues to the function of that tissue.
- The student will be able to categorize connective tissue as proper, supportive, or fluid.
- The student will differentiate between skeletal muscle, smooth muscle, and cardiac muscle.
The student will relate the structure of a neuron to its ability to send and receive signals.

The student will be able to list the body organs comprised of neural tissue.

**Topic: The integumentary system**  
**Duration: 10 Day(s)**

**Description**
The skin protects the body against pathogens and chemicals, minimizes loss or entry of water, and blocks the harmful effects of sunlight; sensory receptors in the skin provide information about the external environment; and the skin helps regulate body temperature in response to environmental changes.

**Learning Targets**
The student will describe the function of melanocytes and melanin.
The student will describe the functions of the secretions of sebaceous glands, ceruminous glands, and eccrine sweat glands.
The student will identify key differences between the hypodermis, dermis, and epidermis.
The student will identify the major protective functions of skin.
The student will identify the role of the integumentary system in regulation of body temperature.
The student will predict what happens to the cells as they move further away from the underlying dermal blood vessels.
The student will state the locations and describe the functions of the stratum germinativum and stratum corneum.
The student will recognize the relationship between UV damage and the three types of skin cancer.

**Topic: The skeletal system**  
**Duration: 10 Day(s)**

**Description**
Bones and joints are needed for movement. Bones have other functions as well: storage site for excess calcium, maintenance of a normal blood calcium level, production of blood cells in the red bone marrow, and protection of vital organs such as the brain, heart, and lungs.

**Learning Targets**
The student will describe the major functions of the skeleton.
The student will be able to label all the bones of the human skeleton or name them by anatomical location.
The student will generalize the major differences between the axial and appendicular skeleton.
The student will describe hormonal control of bone growth and changes at puberty.
The student will explain how bones are classified, and give an example of each type.
The student will describe the role of the skeletal system in the homeostatic maintenance of blood calcium levels.

**Topic: The muscular system**  
**Duration: 10 Day(s)**

**Description**
The muscular system moves the skeleton and produces heat, which contributes to the maintenance of a constant body temperature. These functions are made possible through interactions with the nervous, respiratory, and circulatory systems.

**Learning Targets**
The student will identify the major skeletal muscles of the human body by identifying their location in an analogous dissected specimen.
The student will relate the origin and insertion of a muscle to its action.
The student will differentiate between superficial and deep muscle.
The student will describe the muscle structure in terms of muscle cells, tendons, and bones.

**Unit: Movement and the Human Body**  
**Duration: 6 Week(s)**
Unit Overview
The human body is capable of not only locomotion and manipulation of its surroundings, but is also capable of moving essential substances internally.

Enduring Understandings
Muscles and bones are necessary for locomotion and manipulation of objects.
Joints allow bones to move in specific ways.
Internally, smooth muscle and cardiac muscle moves essential substances within the body

Essential Questions
How do bones, and muscles work together?
How are substances moved through the body?
How do joints allow bones to move in different ways?

Example Assessment Items
Students will dissect a cat and be able to compare analogous muscles in the human.
Students will hypothesize how a specific origin, insertion and action allows the action produced at a joint.

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<tr>
<th>Topic: The muscular system</th>
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<tr>
<td>Description</td>
<td>The muscular system moves the skeleton and produces heat, which contributes to the maintenance of a constant body temperature. These functions are made possible through interactions with the nervous, respiratory, and circulatory systems.</td>
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<tr>
<td>Learning Targets</td>
<td>The student will describe the sliding filament mechanism of muscle contraction.</td>
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<td></td>
<td>The student will be able to identify the structural components of a sarcomere.</td>
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<td>The student will summarize the events involved in the neural control of skeletal muscle function.</td>
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<tr>
<th>Topic: The cardiovascular system</th>
<th>Duration: 10 Day(s)</th>
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<tr>
<td>Description</td>
<td>The functions of blood contribute to the homeostasis of the body as a whole; these functions cannot be carried out without proper circulation of the blood throughout the body.</td>
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<tr>
<td>Learning Targets</td>
<td>The student will state the function of red blood cells, including the protein and the mineral involved.</td>
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<td></td>
<td>The student will describe the major components of blood.</td>
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<td>The student will trace the pathway of blood through a complete cardiovascular circuit.</td>
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<td></td>
<td>The student will name the valves of the heart and explain their functions.</td>
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<td>The student will relate the process of blood clotting to homeostasis.</td>
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<td>The student will describe the effects of atherosclerosis.</td>
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<th>Topic: Joint structure</th>
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<tr>
<td>Description</td>
<td>Joints bind the bones of the skeleton together and allow for movement. The more movement allowed, the less protection the joint affords.</td>
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<tr>
<td>Learning Targets</td>
<td>The student will compare and contrast the types of joints and the movement they allow.</td>
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<td></td>
<td>The student will diagram the basic parts of a synovial joint.</td>
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<td>The student will explain the different causes of arthritis.</td>
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<td>The student will name many of the major joints of the body as well as some of their important ligaments.</td>
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Unit: Homeostatic Regulation | Duration: Ongoing
**Unit Overview**
Homeostasis must be maintained within the body to maintain conditions necessary for life.

**Enduring Understandings**
The human body remains healthy by maintaining homeostasis.
Homeostasis follows either a positive or negative feedback model.
Homeostasis is regulated quickly by the nervous system and slowly by the endocrine system.

**Essential Questions**
How do the receptor, control center, and effector of the negative feedback system work together to maintain homeostasis?
How do the nervous system and endocrine systems differ in the way they maintain homeostasis?

**Example Assessment Items**
Create a model of a real-world control system and relate it to a negative-feedback system of the human body.

<table>
<thead>
<tr>
<th>Topic: Negative and positive feedback</th>
<th>Duration: Ongoing</th>
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<tbody>
<tr>
<td>Learning Targets</td>
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<tr>
<td>The student will develop an analogy for the key parts of a negative feedback system.</td>
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<td>The student will contrast the outcome of a positive feedback system to the outcome of a negative feedback system.</td>
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<tr>
<td>The student will describe real-life examples of both positive and negative feedback systems.</td>
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<tr>
<td>The student will compare and contrast the type of regulation provided by the nervous system and the endocrine system.</td>
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<table>
<thead>
<tr>
<th>Topic: Fast versus slow regulation</th>
<th>Duration: Ongoing</th>
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<tr>
<td>Description</td>
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<tr>
<td>The student will compare and contrast the regulation of the nervous system versus the endocrine system.</td>
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<table>
<thead>
<tr>
<th>Topic: Homeostasis and disease</th>
<th>Duration: Ongoing</th>
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<tr>
<td>Learning Targets</td>
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<tr>
<td>The student will be able to explain that disease is failure of homeostatic regulation.</td>
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<tr>
<td>The student will provide examples of diseases and symptoms for each body system studied.</td>
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<tr>
<td>The student will summarize the consequences of failure to maintain homeostasis of specific conditions (ie blood sugar levels, blood calcium, etc.).</td>
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**Unit: Systems of Exchange**

<table>
<thead>
<tr>
<th>Unit Overview</th>
<th>Duration: 3 Week(s)</th>
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<tr>
<td>Materials must be exchanged between the external environment and the cells of the human body.</td>
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</table>

**Enduring Understandings**
The body must be able to obtain oxygen, fuel and nutrients to power its cells.
The body must be able to return waste to the outside world.

**Essential Questions**
How does the respiratory system work to provide oxygen to cells and return carbon dioxide and water to the environment?
How does the urinary system remove waste from the blood?
How does the digestive system break down food into components that are useable by cells?

**Example Assessment Items**
Trace the flow of oxygen and nutrients from the environment to body cells.
Trace the elimination of carbon dioxide, nitrogenous waste, and feces from the body.

**Academic Vocabulary**
The respiratory system is responsible for the exchange of carbon dioxide and oxygen between blood and tissue.
The digestive system is responsible for breaking down food into nutrients that can be transported and used throughout the body.
The urinary system is responsible for regulating the properties and quantity of body fluids.

<table>
<thead>
<tr>
<th>Topic: The Respiratory System</th>
<th>Duration: 5 Day(s)</th>
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<tbody>
<tr>
<td>Description</td>
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<tr>
<td>Inhalation provides the body with the oxygen necessary for energy production by cell respiration; exhalation removes the carbon dioxide waste product of cell respiration. Breathing regulates the level of carbon dioxide within the body and maintains the pH balance of body fluids.</td>
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<tr>
<td>Learning Targets</td>
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<tr>
<td>The student will describe the locations of the pleural membranes, and explain the functions of serous fluid.</td>
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The student will describe the structure and functions of the nasal cavities and pharynx.
The student will describe the structure and functions of the trachea and bronchial tree.
The student will describe the structure of the alveoli and pulmonary capillaries, and explain the importance of surfactant.
The student will state the general function of the respiratory system.
The student will relate differences in air pressure to inspiration and expiration.
The student will describe the effect of several homeostatic imbalances of the respiratory system (e.g., bronchitis, emphysema, asthma, and lung cancer).

**Topic:** The Digestive System  
**Description**
- The processes of the digestion of food and the absorption of nutrients enable the body to use complex food molecules for many purposes.
- The body produces molecules for growth and repair of tissues, and to facilitate all of the chemical reactions that contribute to homeostasis.
- Some food provides the energy required for growth, repair, movement, sensation, and thinking.

**Learning Targets**
- The student will describe the general functions of the digestive system, and name its major divisions.
- The student will describe the location, structure, and function of the stomach, small intestine, liver, gallbladder, pancreas, and the large intestine.
- The student will explain mechanical and chemical digestion and name the end products of digestion.
- The student will explain the function of saliva and the normal flora of the colon.

**Topic:** The Urinary System  
**Description**
- The kidneys are the principal regulators of the internal environment of the body. The composition of all body fluids is either directly or indirectly regulated by the kidneys as they form urine from blood plasma. The kidneys are also of great importance in the regulation of the pH of the body fluids.

**Learning Targets**
- The student will describe how the kidneys help maintain normal blood volume and blood pressure.
- The student will describe the characteristics of normal urine.
- The student will describe the location and general function of each organ of the urinary system.
- The student will describe the parts of a nephron.

**Unit:** English Language Arts within Science and Technology Content  
**Unit Overview**
- The following unit is aligned with Common Core and focused on the importance of reading and writing in the content areas. This unit is specifically focused on science and technology.

**Enduring Understandings**
- Reading scientific pieces include various elements that are different than in other contents.
- Writing scientific pieces has various elements that are different than in other contents.

**Essential Questions**
- How do reading scientific texts vary from other content areas?
- How do you express your idea and knowledge differently in scientific writings?

**Learning Targets**
- The student will cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- The student will write arguments focused on discipline-specific content.
- Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from or supports the argument presented.

The student will write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

The student will write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

The student will produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

The student will develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

The student will use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

The student will conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

The student will gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.