South Central College

BIOL 230  Human Physiology

Common Course Outline

Course Information

Description
This course provides an in-depth study of the functioning of most body systems, including muscle, nervous, cardiovascular, respiratory, digestive, urinary, and endocrine systems at both the cellular and systemic level. An emphasis is placed on normal physiology, but dysfunction will also be discussed. This course contains a laboratory component. Pre-requisites: Successful completion of BIOL 220, Human Anatomy with a C or better and successful completion of CHEM 108 or CHEM 120 with a C or better. (MNTC goal area 3)

Total Credits 4.00
Total Hours 80.00

Types of Instruction

<table>
<thead>
<tr>
<th>Instruction Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>3</td>
</tr>
<tr>
<td>Lab</td>
<td>1</td>
</tr>
</tbody>
</table>

Pre/Corequisites

Prerequisite Successful completion of BIOL 220 with a C or better.

Prerequisite Successful completion of CHEM 108 or CHEM 120 with a C or better.

Institutional Core Competencies

1 Analysis and inquiry: Students will demonstrate an ability to analyze information from multiple sources and to raise pertinent questions regarding that information.

2 Critical and creative thinking: Students will develop the disposition and skills to strategize, gather, organize, create, refine, analyze, and evaluate the credibility of relevant information and ideas.

3 Foundations and skills for lifelong learning: Students will display an understanding of learning as a lifelong process through demonstration of a desire to learn, the willingness to apply learning to other areas of their lives, the ability to think and act independently, be willing to take the initiative to get projects done, and demonstrate the ability to reflect upon what has occurred and how it impacts the student and others.

4 Teamwork and problem-solving: Students will demonstrate the ability to work together cohesively with diverse groups of persons, including working as a group to resolve any issues that arise.
External Standards

Title  MN Transfer Goals

Target Standards
Goal 3: Natural Sciences - To improve students' understanding of natural science principles and of the methods of scientific inquiry, i.e., the ways in which scientists investigate natural science phenomena. As a basis for lifelong learning, students need to know the vocabulary of science and to realize that while a set of principles has been developed through the work of previous scientists, ongoing scientific inquiry and new knowledge will bring changes in some of the ways scientists view the world. By studying the problems that engage today's scientists, students learn to appreciate the importance of science in their lives and to understand the value of a scientific perspective. Students should be encouraged to study both the biological and physical sciences.

3a - Demonstrate understanding of scientific theories.
3b - Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
3c - Communicate their experimental findings, analyses, and interpretations both orally and in writing.
3d - Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

Course Competencies

1 Define homeostasis by classifying regulatory feedback systems.
   Learning Objectives
   Describe how homeostasis operates under a negative feedback system.
   Identify the components of a negative feedback system in a physiological system.
   Describe how feedforward regulation helps maintain homeostasis.
   Explain positive feedback and its role in reproduction and disease.

2 Demonstrate a basic understanding of the cell.
   Learning Objectives
   Identify the chemical composition of the cell.
   Explain the functions of the organelles within the cell.
   Describe the process of cell respiration.
   Identify the modes of cell transport.
   Explain how the distribution of ions across the membrane affects chemical forces.
   Explain how membrane potential affects electrical forces across the membrane.
   Compare and contrast graded and action potentials.
   Demonstrate properties and characteristics of enzymes through experimentation.

3 Describe synaptic transmission.
   Learning Objectives
   List the steps of synaptic transmission.
   Explain the role excitatory and inhibitory post synaptic potentials have on synaptic transmission.
   Describe the effect of various drugs and toxins on synaptic transmission.
   Describe neuronal integration.

4 Explain how the nervous system functions.
   Learning Objectives
Identify the structures of the central nervous system and list their functions.
Describe integrated central nervous system function.
Explain sensory transduction in each of the sensory systems.
Explain how the brain interprets sensory information.
Compare and contrast the functions of the two branches of the autonomic nervous system.
Categorize reflexes and describe the components of a reflex arc.
Become proficient in performing and interpreting stretch reflexes.

5 Describe the properties of skeletal muscle.
Learning Objectives
List the steps involved in a skeletal muscle contraction.
Describe the effects of toxins and drugs on the neuromuscular junction.
Describe the relationship between agonistic and antagonistic muscles by interpreting EMG tracings.
List the mechanisms involved in recruitment, summation and the length tension relationship.

6 Describe the properties of the cardiac muscle.
Learning Objectives
Describe Frank-Starling's law of the heart.
Explain the effect of stimulating the right vagus nerve.
Describe how the refractory period prevents summation in the heart.
Describe the conduction of the action potential through the heart.
Recognize arrhythmias by reading ECG strips.

7 Compare and contrast the physiology of the three muscle types.
Learning Objectives
Describe how each type of muscle creates a change in membrane potential.
Describe the subcellular mechanisms of excitation contraction coupling in each muscle type.
Explain the factors that influence the force of contraction in each muscle type.

8 Explain the physiology of the cardiovascular system.
Learning Objectives
Describe the cardiac cycle.
Identify factors that influence cardiac output and mean arterial pressure.
Predict what changes will occur in capillary forces in given medical conditions.
Describe short and long regulation of mean arterial blood pressure.
Predict cardiovascular responses to real or theoretical conditions.
Demonstrate the effect of position change, decreased temperature and the valsalva maneuver on peripheral blood flow and mean arterial pressure.

9 Describe the functions of the blood.
Learning Objectives
Distinguish between specific and nonspecific immunity.
Explain the mechanisms in cell mediated and humoral immunity.
Describe types of immune dysfunctions.
Describe blood types and predict compatibility for blood transfusions.
Explain the mechanisms involved in hemostasis.
Describe the life cycle of erythrocytes.
Identify the five types of leukocytes and list the functions of each type.
Develop an understanding of various hematology tests.
Identify various types of immunity.
10 **Explain the physiology of the respiratory system.**

Learning Objectives
Use Boyle’s law to describe the process of ventilation.
Describe gas transport in the respiratory system.
Explain how changes in the carbon dioxide level in the blood affect pH.
Predict the effect of various activities on respiration by using the chemoreceptor reflex.
Identify and measure pulmonary volumes to predict pulmonary disorders.
Explain the oxygen-hemoglobin dissociation curve.
Explain the Haldane effect and Bohr effect.
Describe respiratory system disorders.

11 **Describe the function of the urinary system.**

Learning Objectives
Identify the anatomy of the urinary system.
Explain the processes involved in urine formation.
Describe hormone regulation of the kidneys.
Explain how the kidney’s regulate pH.
Explain how the kidneys regulate fluid and electrolytes in the system.
List the steps involved in micturition.
Use urinalysis to identify various disorders of the urinary system.

12 **Explain how the endocrine system regulates body function.**

Learning Objectives
Identify the major endocrine glands and the hormones they secrete.
Describe hormone actions at the target tissues.
Describe hormone interactions.
Explain hormone regulation.
Describe conditions that occur as a result of abnormal hormone secretion.

13 **Describe the role of the gastrointestinal system in digestion.**

Learning Objectives
Explain the mechanisms of digestion of protein, fats, and carbohydrates.
Explain the mechanisms of absorption of amino acids, glucose, fat, vitamins, sodium and water.
Describe hormonal regulation of digestion.
Explain the role of the accessory structures in digestion.

14 **Explain the physiology of the reproductive system.**

Learning Objectives
Identify the structures of the male and female reproductive systems and explain their functions.
Explain gametogenesis.
Describe hormonal regulation of the menstrual cycle.
Explain hormonal regulation of pregnancy.
Explain hormonal changes that occur with menopause.

15 **Develop laboratory skills.**

Learning Objectives
Develop skills in data acquisition using BioPac systems.
Collect and graph data.
Analyze and interpret experimental data.
16 Demonstrate safe laboratory practices.

Learning Objectives
Be aware of any hazardous materials in the lab.
Handle chemicals and equipment in a safe manner.

SCC Accessibility Statement
If you have a disability and need accommodations to participate in the course activities, please contact your instructor as soon as possible. This information will be made available in an alternative format, such as Braille, large print, or cassette tape, upon request. If you wish to contact the college ADA Coordinator, call that office at 507-389-7222.

Disabilities page http://southcentral.edu/academic-policies/disability-rights.html