

Montgomery County Community College  
 BIO 129  
 Functional Human Anatomy and Physiology  
 4-3-3

**COURSE DESCRIPTION:**

This course provides a background in human anatomy and physiology, with emphasis being placed on the skeletal, muscular, cardiovascular, and respiratory systems. This course is oriented towards students in Exercise Science and Wellness degree programs. Dissection of preserved animal tissue is required.

*Previous Course Requirements:*

- ENG 010A Basic Writing or ENG 011 Basic Writing II or ESL 011 Basic Writing II
- REA 011 Fundamentals of College Reading or REA 017 Vocabulary and Reading Comprehension Development II

*Concurrent Courses:*

- MAT 090 - Fundamentals of Algebra, or MAT 011 - Beginning Algebra, or MAT 011B - Beginning Algebra with Review of Arithmetic with a minimum grade of C within 5 years. May be taken prior or during course.

Upon successful completion of this course, the student will be able to:

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
1. Define basic terms relating to direction, orientation, and body areas.	Lecture Reading Assignments Quizzes	Tests Comprehensive Final Exam
2. Discuss basic aspects of chemistry as they relate to anatomy and physiology.	Lecture Reading Assignments Quizzes	Tests Comprehensive Final Exam
3. Describe cell structure and membrane transport.	Lecture Laboratory Reading Assignments Quizzes	Tests Comprehensive Final Exam
4. Identify the function of various tissue types, particularly bone, skeletal muscle and connective tissues	Lecture Laboratory Reading Assignments Quizzes	Tests Comprehensive Final Exam
5. Identify anatomic components of all 11 body systems and discuss the normal functioning of each,	Lecture Laboratory Reading Assignments Quizzes	Tests Comprehensive Final Exam Lab Practical

integrating structure with function.	Brief Research Paper	
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LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
6. Describe selected pathologies in terms of causes and/or treatment.	Lecture Reading Assignments Quizzes Brief Research Paper	Tests Comprehensive Final Exam
7. Identify selected anatomic structures in the laboratory, from either models or preserved specimens.	Lecture Laboratory Reading Assignments Quizzes	Tests Comprehensive Final Exam Lab Practical

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria.*

#### SEQUENCE OF TOPICS:

- I. Introduction
  - A. Terms of Direction, Orientation, & Body Areas
  - B. Body Planes
  - C. Definition of Homeostasis, Positive Feedback
- II. Basic Chemistry
  - A. Overview of Atomic Structure
  - B. pH
  - C. Chemistry of Carbohydrates, Proteins, Lipids, & Nucleic Acids
- III. Cell Structure & Function
  - A. Membrane Structure
  - B. Cell Organelles
  - C. Membrane Transport: Diffusion, Osmosis, Active Transport, Phagocytosis, Exocytosis
  - D. Overview of Protein Synthesis
- IV. Histology of Epithelial, Connective, Muscle & Nervous Tissue
  - A. Characteristics
  - B. Locations
  - C. Functions
- V. Integumentary System
  - A. Overview of Structure
  - B. Overview of Function
  - C. Role in Homeostasis of Body Temperature
  - D. Skin Color

- VI. Skeletal System
  - A. Histology of Osseous Tissue
  - B. Osteogenesis: Intramembranous & Endochondral Ossification
  - C. Growth at Epiphyseal Plate
  - D. Names & Markings of Individual Bones
  - E. Osteoporosis
  - F. Vertebral Curvatures & Curvature Disorders
  - G. Structure & Function of Synovial Joints
  - H. Definition & Examples of Types of Movements: Flexion, Extension, Hyperextension, Supination, Pronation, Inversion, Eversion, Abduction, Adduction, Circumduction & Rotation
  - I. Structure of Joints
  - J. Classification of Articulations Based on Structure & on Amount of Movement
  - K. Arthritis
- VII. Muscle System
  - A. Histology of Skeletal Muscle Tissue
  - B. Physiology of Contraction (Sliding Filament Theory)
  - C. Energy Sources for Contraction
    - 1. Aerobic Respiration
    - 2. Anaerobic Respiration
  - D. Comparison of Slow & Fast Twitch Fibers
  - E. Myograms: Simple Twitch, Treppe, Summation & Tetany
  - F. Types of Contractions: Isotonic, Isometric, Concentric, Eccentric
  - G. Identification of Major Muscles & Their Actions, Origins & Insertions: Trapezius, Pectoralis Major, Latissimus Dorsi, Biceps, Triceps, Rectus Abdominus, Internal & External Obliques, Erector Spinae, Gluteus Maximus, Quadriceps, Hamstrings, Adductors, Abductos, Gastrocnemius, & Sternocleidomastoid
  - H. Definitions of Agonist, Antagonist, Synergist, & Stabilizer
- VIII. Nervous System
  - A. Functions & Divisions
  - B. Types of Neurons: Sensory, Motor, Association; & Unipolar, Bipolar, & Multipolar
  - C. Role of Myelin
  - D. Resting Membrane Potential & Action Potential
  - E. Nerve Plexuses and Muscles Innervated
  - F. Overview of Stroke & Multiple Sclerosis
  - G. Autonomic Nervous System: Compare Sympathetic & Parasympathetic Divisions in Terms of Function, Neurotransmitters, & Receptors
- IX. Endocrine System
  - A. Hormone-Target Cell Specificity
  - B. Major Hormones: Targets & Effects

- X. Cardiovascular System
  - A. Major Components of Blood & Their Functions, including role of hemoglobin in oxygen transport.
  - B. Structure of the Heart in Terms of Wall, Chambers, Valves, & Great Vessels. Include Path of Blood Flow, Systemic & Pulmonary Circulation.
  - C. Cardiac Conduction System
  - D. Cardiac Cycle
  - E. Definition & Comparison Arteries, Veins, & Capillaries in Terms of Vessel Wall & Blood Pressure
  - F. Location of Anatomic Landmarks for Palpation of Peripheral Pulse
  - G. Blood Pressure: Typical Value, Factors that Determine BP, Factors Regulating BP
  - H. Definitions of Ischemia, Angina Pectoris, Tachycardia, Bradycardia, Arrhythmia, Myocardial Infarction, Cardiac Output, Stroke Volume
  - I. Role of ANS in Regulation of Heart Rate
- XI. Lymphatic System
  - A. Structure
  - B. Functions
  - C. Lymphedema
- XII. Digestive System & Metabolism
  - A. Structure & Function
  - B. Role of Carbohydrates, Lipids & Proteins as Fuels for Aerobic & Anaerobic Respiration
  - C. Functions of Lipoproteins Including VLDL, LDL, HDL. Recommended Levels for Total Cholesterol, LDL, HDL, & Triglycerides.
  - D. Distinguish Between Fat & Water Soluble Vitamins
  - E. Role of Calcium & Iron in Women's Health
  - F. Comparison of Absorptive and Post-Absorptive States
- XIII. Respiratory System
  - A. Structure
  - B. Function
  - C. Lung Capacities: Tidal Volume, Inspiratory Reserve, Expiratory Reserve, Vital Capacity, Total Lung Capacity
  - D. Breathing Mechanism for Inspiration and Expiration
  - E. Oxygen Transport by Hemoglobin, Including Conditions Under Which Hemoglobin Unloads Oxygen
- XIV. Overview of Urinary System
  - A. Structure of Urinary System & Nephron
  - B. Functions
  - C. Overview of Filtration, Reabsorption, and Secretion
  - D. Release of Erythropoietin
- XV. Overview of Reproduction System
  - A. Structure & Function of Male, Including Role of Testosterone
  - B. Structure & Function of Female; Overview of Female Reproductive Cycle
  - C. Female Athlete Triad

**LABORATORY TOPICS:**

(May be covered on one or on multiple days)

1. Microscopy
2. Histology of Epithelial, Connective & Muscle Tissues
3. Identification of Disarticulated Bones & Selected Markings
4. Identification of Major Human Muscles on Models, Examination of Muscles
5. Dissection of a Sheep Heart
6. Identification of Major Arteries & Veins on Vascular Models
7. Measurement of Various Lung Capacities Using Wet Spirometers
8. Dissection of a Mammal
9. Urinalysis – Ketones, Glucose, PH

**LEARNING MATERIALS:**Required textbook:

Kuntzman, Andrew & Tortora, Gerard. (2010). Anatomy & Physiology for the Manual Therapies. J. Wiley & Sons Publishers.

Required laboratory manual:

Marieb, Elaine. (2009). *Laboratory Manual for Anatomy & Physiology*. Benjamin Cummings Publishers.

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

**COURSE APPROVAL:**

Prepared by:	Judy Cunningham, Assistant Professor of Biology	Date:	8/10/2006
Revised by:	Judy Cunningham, Assistant Professor of Biology	Date:	3/18/2009
Revised by:	Judy Cunningham, Assistant Professor of Biology and Dr. Anne Livezey	Date:	3/1/2010
Interim VPAA/Provost Compliance Verification:	Victoria L. Bastecki-Perez, Ed.D.	Date:	9/28/2010
Revised by:	Judith Cunningham	Date:	12/12/2012
VPAA/Provost or designee Compliance Verification:	Victoria L. Bastecki-Perez, Ed.D.	Date:	5/23/2013
Revised by:	Judy Cunningham, Assistant professor of Biology	Date:	6/18/2014
VPAA/Provost or designee Compliance Verification:	Victoria L. Bastecki-Perez, Ed.D.	Date:	6/30/2014
Revised by:	James Bretz	Date:	6/7/2023
VPAA or designee Compliance Verification:		Date:	6/7/2023

A handwritten signature in cursive script, appearing to read "Chairwoman", enclosed within a faint, light-colored rectangular border.

*This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.*