BIO-1221: ANATOMY AND PHYSIOLOGY FOR DIAGNOSTIC MEDICAL IMAGING

Cuyahoga Community College

Viewing: BIO-1221: Anatomy and Physiology for Diagnostic Medical Imaging

Board of Trustees:
May 2019

Academic Term:
Fall 2019

Subject Code
BIO - Biology

Course Number:
1221

Title:
Anatomy and Physiology for Diagnostic Medical Imaging

Catalog Description:
Basic understanding of cells, tissues, organs and body systems. Examination of their function based on their relationship to diagnostic medical imaging examinations. Particular emphasis placed on the skeletal system and the radiographic appearance of anatomical structures.

Credit Hour(s):
4

Lecture Hour(s):
3

Lab Hour(s):
3

Requisites

Prerequisite and Corequisite
MA-1020 Medical Terminology I or concurrent enrollment.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.
For specific information pertaining to ADA accommodation, please contact your campus SAS office or visit online at http://www.tri-c.edu/accessprograms/. Blackboard accessibility information is available at http://access.blackboard.com.

III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts.

Therefore, attendance is recorded in the following ways:

- For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.
- For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have "Never Attended" a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts,’ for assessment of course and program outcomes and the College's Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student’s grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available athttp://www.tri-c.edu/student-resources/documents/studenthandbook.pdf. You must also comply with the College’s Zero Tolerance for Violence on College Property available athttp://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf.

Outcomes

Course Outcome(s):

Use anatomical terms of position, direction and movement to describe the human body and its parts in the anatomical position.
Objective(s):
1. Describe the human body in anatomical position
2. Discuss the basics of anatomical nomenclature.
3. Identify common planes of section through the human body and its parts.
4. Identify the body cavities, their structural limits, functions and contents.
5. Identify specific surface landmarks.

Course Outcome(s):
Use appropriate scientific terminology to describe the chemical components of the human body.

Objective(s):
1. Describe the structural and functional organization of the cell membrane.
2. List and briefly describe the different mechanisms of transmembrane transport.
3. Differentiate between active and passive transport mechanisms.
4. Describe the cytoplasm.
5. Identify the major cellular organelles and briefly describe their functions in the cell.
6. Briefly explain the process of gene expression including RNA and protein synthesis.
7. Describe nuclear and cellular reproduction in somatic and gamete-producing cells.
8. Briefly explain the consequences of abnormal nuclear and cellular reproduction in both somatic and gamete-producing cells.

Course Outcome(s):
Explain the essentials of human metabolism.

Objective(s):
1. Define anabolism and catabolism.
2. Briefly explain the function of enzymes and their role in metabolism.
3. Briefly describe the metabolism of carbohydrates, lipids and proteins.
4. Explain homeostatic regulation and the roles of negative and positive feedback in maintaining the body.

Course Outcome(s):
Describe the structural and functional organization of the human body from the tissue through organ system levels.

Objective(s):
1. Identify and describe the four primary tissue types, the functional characteristics of each and give examples of their location within the human body.
2. Identify the organ systems, their constituent organs and their main functions in the human body.
3. Understand the role of radiographic contrast media in the visualization of body tissues and organs.

Course Outcome(s):
Using appropriate anatomical terms for direction and orientation, identify and describe the components of the human skeleton, their individual features and their relationships to one another and other anatomical structures.

Objective(s):
1. Summarize the functions of the skeletal system.
2. Describe the structural organization of osseous tissue.
3. Describe the process of bone development and growth.
4. State the classifications and markings of bones.
5. Identify and locate all of the bones of the human skeleton including all processes, projections, depressions and openings.
6. Be able to distinguish lefts from rights for selected disarticulated bones.
7. Distinguish between the axial and appendicular divisions of the skeleton and identify the bones of each division and specific bony landmarks.
8. Differentiate between primary and secondary curves of the spine.
9. Identify anatomy on radiographic images of all of the bones in human skeleton including all processes, projections, depressions and openings.
10. List and define the structural and functional joint classifications.
11. Label different types of articulations.
12. Compare the types, locations and movements permitted by the different types of articulations.
13. Apply the appropriate structural and functional classifications to specific joints in the body.
14. Describe common movements at joints in reference to anatomical planes.

**Course Outcome(s):**
Describe the structural and functional organization of the muscular system.

**Objective(s):**
1. State the function of each of the three types of muscle tissue.
2. Name and locate the major muscles of the body.

**Course Outcome(s):**
Demonstrate basic knowledge of the central and peripheral nervous systems.

**Objective(s):**
1. Differentiate between the structure and function of the different types of nerve cells.
2. Label the parts of a neuron.
3. State the functions of a neuron.
4. List the different types of neuroglia and know their function.
5. State the structure of the brain and the relationship of its component parts.
6. Describe brain functions.
7. List the meninges and describe the function of each.
8. Outline how cerebrospinal fluid forms, circulates and functions.
9. Identify interventricular foramen, cerebral aqueduct and the ventricles of the brain.
10. Describe the structure and function of the spinal cord.
11. Determine the distribution and function of the cranial and spinal nerves.
12. List 12 pair of cranial nerves including the function of each.
13. Distinguish between sympathetic nervous system and parasympathetic nervous system.
14. Summarize the structure and function of components that comprise the autonomic nervous system.

**Course Outcome(s):**
Apply knowledge of the sensory system to understand the human body.

**Objective(s):**
1. Describe the structures and functions of the components that comprise the human eye and ear.
2. List the component body parts involved in the senses of smell and taste.
3. List the somatic senses.

**Course Outcome(s):**
Apply knowledge of the endocrine system to understand the human body.

**Objective(s):**
1. Define endocrine.
2. Describe the characteristics and functions of the components that comprise the endocrine system.
3. Distinguish between an endocrine and an exocrine gland.
4. Know the homeostatic control of endocrine system.

**Course Outcome(s):**
Apply knowledge of the digestive system to understand the human body.

**Objective(s):**
1. Label the four quadrants and nine regions of the abdomen including organs contained in each.
2. Describe the hard and soft palates.
3. Describe the structure and function of the tongue.
4. Identify the structure, function and locations of the salivary glands.
5. Describe the composition and characteristics of the primary organs of the digestive system.
6. Describe the function(s) of each primary organ of the digestive system.
7. Differentiate between the layers of tissue that comprise the esophagus, stomach, small intestine, large intestine and rectum.
8. Differentiate between peritoneum, omentum and mesentery
9. List and label the accessory organs of the digestive system and describe their function.
10. Identify the secretions and function of each accessory organ of the digestive system.
11. List in order the steps of digestion and explain the purpose of digestion.
12. List the digestive processes that occur in the body.
13. Locate any abdominal organ with the aid of palpable landmarks.
14. Identify specific anatomy on radiographic images to include the following esophagus, stomach, small intestine, large intestine and rectum.

Course Outcome(s):
Apply knowledge of the cardiovascular system to understand the human body.

Objective(s):
1. Describe the composition and characteristics of blood.
2. List the types of blood cells and state their functions.
3. Differentiate between blood plasma and serum.
4. Outline the clotting mechanism.
5. List the blood types.
6. Explain the term Rh factor.
7. Explain the antigen/antibody relationship and its use in blood typing.
8. Label the structures of the human heart.
9. Trace the flow of blood from the superior and inferior vena cava through the heart to the aorta.
10. Describe the flow of blood through the body and identify the main vessels.
11. Label and identify major arteries and veins and their branches according to portion of the body which they supply.
12. Describe the structure and function of arteries, veins and capillaries.
15. State the significance of systolic and diastolic pressures
16. Correlate electrocardiogram (ECG) tracings to a normal cardiac rhythm.

Course Outcome(s):
Apply knowledge of lymphatic system to understand the human body.

Objective(s):
1. List and identify the lymphatic vessels, lymphatic organs and lymphatic tissue components of lymphatic system.
2. Describe the formation and characteristics of lymph.
3. State the function of lymphatic system.
4. Outline the major pathways of lymphatic circulation.
5. Differentiate between nonspecific defenses and specific immunity.
6. Explain antibody production and function.
7. List the different types and functions of T- and B-cells and explain their functions.
8. Differentiate between passive and active immunity.

Course Outcome(s):
Apply knowledge of respiratory system to understand the human body.

Objective(s):
1. Name the divisions of the thorax and their contents.
2. Label the components of the respiratory system.
3. Describe the physiology and regulation of respiration.
4. Identify specific anatomy on radiographic images to include the mediastinum, trachea, heart, lungs and diaphragm.
Course Outcome(s):
Apply knowledge of urinary system to understand the human body.

Objective(s):
1. Label the parts of the kidneys, ureters, bladder and urethra.
2. Describe the function of each organ of the urinary system.
3. Describe the composition and function of urine.
4. Explain micturition.
5. Identify specific anatomy on radiographic images to include kidneys, ureters and bladder.

Course Outcome(s):
Apply knowledge of reproductive system to understand the human body.

Objective(s):
1. Label the anatomy of the internal and external male and female reproductive organs.
2. Analyze the function of each of the male and female reproductive organs.
3. Trace the pathway of a sperm from its origin as it transits to the exterior.
4. Explain reproductive physiology as it relates to the ovarian, cycle, menstrual cycle, aging and menopause.

Course Outcome(s):
Demonstrate knowledge of sectional anatomy in relation to the human body.

Objective(s):
1. Identify the major anatomical structures found within the head and neck.
2. Identify the major anatomical structures located in the thorax.
3. Identify the major anatomical structures located within the abdomen.
4. Identify specific anatomy on radiographic images.

Methods of Evaluation:
1. Quizzes
2. Written examinations
3. Practical examinations including Radiographic Image Evaluation

Course Content Outline:

Content Outline
1. Anatomical Nomenclature
   a. Directional references
      i. Anterior/posterior
      ii. Ventral/dorsal
      iii. Medial/lateral
      iv. Superior/inferior
      v. Proximal/distal
      vi. Cephalad/caudad
   b. Body planes
      i. Median/midsagittal
      ii. Sagittal
      iii. Coronal
      iv. Transverse
      v. Longitudinal
   c. Body cavities – structural limits, function, contents
      i. Cranial
      ii. Thoracic
      iii. Abdominal/pelvic
2. Chemical Composition
   a. Atoms
   b. Chemical bonds
c. Inorganic compounds
   i. Acids
   ii. Bases
   iii. Salts
   iv. Water
d. Organic compounds
   i. Carbohydrates
   ii. Lipids
   iii. Proteins
   iv. Nucleotides
      1. DNA
      2. RNA
3. Cell Structure and Genetic Control
   a. Cell membrane
      i. Chemistry
      ii. Structure
      iii. Physiology
      iv. Transport processes
         1. Diffusion
         2. Osmosis
         3. Filtration
         4. Active transport and physiological pumps
         5. Phagocytosis and pinocytosis
   b. Cytoplasm
   c. Organelles
      i. Nucleus
      ii. Ribosomes
      iii. Endoplasmic reticulum
      iv. Golgi complex
      v. Mitochondria
      vi. Lysosomes
      vii. Peroxisomes
      viii. Cytoskeleton
      ix. Centrosome and centrioles
      x. Flagella and cilia
d. Gene action
   i. Protein synthesis
   ii. Nucleic acid (RNA/DNA) synthesis
   iii. Transcription
   iv. Translation
e. Cell reproduction
   i. Mitosis
   ii. Meiosis
   f. Aberration and abnormal cell division
4. Metabolism
   a. Anabolism
   b. Catabolism
   c. Enzymes and metabolism
   d. Carbohydrate metabolism
   e. Lipid metabolism
   f. Protein metabolism
   g. Regulation and homeostasis
5. Tissues
   a. Types of tissue
      i. Epithelial
      ii. Connective
      iii. Muscle
      iv. Nerve
b. Tissue repair
c. Role of radiographic contrast media in the visualization of anatomical structures

6. **Skeletal System**
   a. Osseous tissue
   i. Structural organization
      1. Medullary cavity/marrow
      2. Compact bone
      3. Cancellous bone
      4. Periosteum
      5. Cartilage
   ii. Development and growth
      1. Physis
      2. Diaphysis
      3. Epiphyseal line
      4. Metaphysis
   iii. Classification and markings
   iv. Long
   v. Short
   vi. Flat
   vii. Irregular
   viii. Processes and bony projections
   ix. Depressions and openings
   b. Divisions
      i. Axial
         1. Skull
         2. Hyoid bone
         3. Vertebral column
         4. Thorax
      ii. Appendicular
         1. Pectoral girdle
         2. Upper extremities
         3. Pelvic girdle
         4. Lower extremities
      iii. Sesamoids
   iv. Functions
   c. Radiographic appearance of bones to include all processes, projections, depressions and openings.
   d. Articulations
      i. Types
         1. Synarthroses, fibrosis
         2. Amphiarthroses, cartilaginous
         3. Diarthroses, synovial
      ii. Movement

7. **Muscular System**
   a. Types and characteristics
      i. Smooth
      ii. Cardiac
      iii. Skeletal
   b. Functions

8. **Nervous System**
   a. Neural tissue – structure and function
      i. Neurons
      ii. Neuroglia
   b. Central nervous system – structure and function
      i. Brain and cranial nerves
      ii. Spinal cord
   c. Peripheral nervous system – structure and function
      i. Sympathetic nerves
      ii. Parasympathetic nerves

9. **Sensory System**
a. General senses
   i. Nociperception
   ii. Chemoreception
   iii. Thermoreception
   iv. Mechanoreception
b. Special senses – structure, function
   i. Vision
   ii. Hearing and equilibrium
   iii. Olfaction
   iv. Gustation
   v. Tactile

10. Endocrine System
    a. Primary organs - structure, function and location
    b. Homeostatic control
    c. Endocrine tissue and related hormones
       i. Pituitary (hypophysis) gland
       ii. Pineal gland
       iii. Thyroid gland
       iv. Parathyroid gland
       v. Adrenal (suprarenal) glands
       vi. Heart and kidneys
       vii. Digestive system
       viii. Pancreas
       ix. Testes
       x. Ovaries
       xi. Thymus
       xii. Placenta

11. Digestive System
    a. Primary organs – structure, function and location
       i. Oral cavity
       ii. Esophagus
       iii. Stomach
       iv. Small intestine
       v. Large intestine
       vi. Rectum
    b. Accessory organs – structure, function and location
       i. Salivary glands
       ii. Pancreas
       iii. Liver
       iv. Gallbladder
    c. Digestive processes
       i. Ingestion
       ii. Peristalsis
       iii. Segmentation
       iv. Digestion
       v. Absorption
       vi. Defecation
d. Radiographic appearance of primary digestive structures

12. Cardiovascular System
    a. Blood
       i. Composition
       ii. Clotting system
       iii. Hemopoiesis
       iv. Function
    b. Heart and vessels
       i. Anatomy
       ii. Function
c. Electrocardiogram (ECG) tracings correlated to normal cardiac rhythm

13. Lymphatic System and Immunity
a. Lymphatic system
   i. Lymph vessels
   ii. Lymphatic organs
      1. Thymus
      2. Lymph nodes
      3. Spleen
   iii. Lymphatic tissue
      1. Tonsils
      2. Peyer's patches
b. Immune system
   i. Nonspecific defenses
      1. Physical barriers
      2. Leukocytes
      3. Immunological surveillance
   ii. B-cell response
      1. Production
      2. Types of immunoglobulins
      3. Function
      4. Regulation of B-cell response
   iii. T-cell response
      1. Production
      2. Types
      3. Function
      4. Regulation of T-cell response
   iv. Passive and active immunity

14. Respiratory System
    a. Components, structure and function
       i. Nose and sinus cavities
       ii. Pharynx
       iii. Larynx
       iv. Trachea
       v. Bronchi
       vi. Lungs
       vii. Thorax
    b. Physiology
       i. Pulmonary ventilation
       ii. Alveolar gas exchange
       iii. Transport of blood gases
       iv. Tissue gas exchange
       v. Control and regulation of respiration
    c. Radiographic appearance of primary structures in the thorax

15. Urinary System
    a. Components, structure and function
       i. Kidneys
       ii. Ureters
       iii. Bladder
       iv. Urethra
    b. Urine
       i. Physical characteristics
       ii. Chemical composition
    c. Micturition
    d. Radiographic appearance of primary urinary structures

16. Reproductive System
    a. Male – structure, function and location
       i. External organs
       ii. Internal organs
    b. Female – structure, function and location
i. External organs  
ii. Internal organs  
iii. Mammary glands  
c. Reproductive physiology  
i. Ovarian cycle  
ii. Menstrual cycle  
iii. Aging and menopause  

17. Introduction to Sectional Anatomy  
a. Structures and locations  
b. Head/neck  
i. Brain  
ii. Cranium  
iii. Major vessels  
c. Thorax  
i. Mediastinum  
ii. Lung  
iii. Heart  
iv. Airway  
v. Major vessels  
d. Abdomen  
i. Liver  
ii. Biliary  
iii. Spleen  
iv. Pancreas  
v. Kidneys and ureters  
vi. Peritoneum  
vii. Retroperitoneum  
viii. Gastrointestinal (GI) tract  
ix. Major vessels  
e. Radiographic appearance of primary structures in the head/neck, thorax and abdomen  

Resources  


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