Human Anatomy & Physiology I
BIOL 221 – Fall Semester 2017
10:50am-12:05pm, Tuesday and Thursday, SSMB 138

Instructor: Dr. Jason Vance
e-mail: vancejt@cofc.edu (please put “Biol221” in Subject Line)
Office: 204 HarborWalk West (HWWE)
Phone: 843-953-4880 (Do Not Leave a Message)
Office Hours: M Tu W Th, 1-2pm, or by appointment

Required text: Human Anatomy and Physiology, 10th Ed. (Marieb and Hoehn)
Recommended Resources: Complete Anatomy (app), Mastering A&P (Pearson)

Course Description
BIOL 221, Human Anatomy & Physiology I, explores the gross morphology, microscopic anatomy, structure and function of the integumentary, skeletal, nervous, muscular (skeletal, cardiac, and smooth) and endocrine systems of the human body. In addition, the lab presents the histology and gross anatomy of these tissues, organs and organ systems, and provides hands-on experience for learning the topics and principles of physiology presented in the lecture. This course is intended for pre-allied health, pre-nursing, and physical education majors.

Learning Outcomes
1. Identify and use the basic vocabulary of human anatomy and physiology.
2. Reiterate key physiological processes, and the relationship between structure and function.
3. Relate physiology to human health and disease.
4. Demonstrate an understanding of the scientific method and experimental design.
5. Demonstrate continued development of written, oral, and computational skill sets.
6. Demonstrate the ability to work as part of team.

Lecture Schedule

<table>
<thead>
<tr>
<th>Week of</th>
<th>Topic</th>
<th>Book Chapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/21</td>
<td>Intro, Homeostasis</td>
<td>1</td>
</tr>
<tr>
<td>8/28</td>
<td>Cell, Tissues</td>
<td>2, 3, 4</td>
</tr>
<tr>
<td>9/4</td>
<td>Tissues</td>
<td>4</td>
</tr>
<tr>
<td>9/11</td>
<td>Integumentary System</td>
<td>5</td>
</tr>
<tr>
<td>9/18</td>
<td>Bone – Structure</td>
<td>6</td>
</tr>
<tr>
<td>9/25</td>
<td>Bone - Development/Growth</td>
<td>6</td>
</tr>
<tr>
<td>10/2</td>
<td>Skeletal System, Joints</td>
<td>8</td>
</tr>
<tr>
<td>10/9</td>
<td>Excitable Cell Physiology</td>
<td>3, 11</td>
</tr>
<tr>
<td>10/16</td>
<td>Excitable Cell Phys, Neuron, Aps, GPs</td>
<td>11</td>
</tr>
<tr>
<td>10/22</td>
<td>Muscle - Skeletal</td>
<td>9</td>
</tr>
<tr>
<td>10/30</td>
<td>Muscle – Skeletal</td>
<td>9, 10</td>
</tr>
<tr>
<td>11/6</td>
<td>Muscle – Cardiac and Smooth</td>
<td>9, 18</td>
</tr>
<tr>
<td>11/13</td>
<td>Metabolism</td>
<td>9, 24</td>
</tr>
<tr>
<td>11/20</td>
<td>Endocrine System</td>
<td>16</td>
</tr>
<tr>
<td>11/27</td>
<td>Endocrine System</td>
<td>16</td>
</tr>
<tr>
<td>Final Exam (Cumulative)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes, Exams
- Exam 1 - 9/14
- Exam 2 - 10/10
- Fall Break 10/16-17
- Exam 3 – 11/9
- Thanksgiving Holiday: 11/22
- Tues. Dec 12, 8:00am
# LAB SCHEDULE

<table>
<thead>
<tr>
<th>Week of</th>
<th>Topic</th>
<th>Book</th>
<th>Chapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/21</td>
<td>No Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/28</td>
<td>Intro, Microscopy, Cell, Histology</td>
<td>3, 4</td>
<td></td>
</tr>
<tr>
<td>9/4</td>
<td>Histology</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>9/11</td>
<td>Histology, Integument</td>
<td>4, 5</td>
<td></td>
</tr>
<tr>
<td>9/18</td>
<td>Bone, Skeleton</td>
<td>6, 8</td>
<td></td>
</tr>
<tr>
<td>9/25</td>
<td>Skeleton</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>10/2</td>
<td>Skeleton</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>10/9</td>
<td>LAB PRACTICAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/16</td>
<td>Fall break, no labs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/22</td>
<td>Muscle - head, torso; Electromyography experiment</td>
<td>9, 10</td>
<td></td>
</tr>
<tr>
<td>10/30</td>
<td>Muscle - arms, legs; Reflex latency experiment</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11/6</td>
<td>Muscle</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11/13</td>
<td>Endocrine</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>11/20</td>
<td>Thanksgiving Holiday, no labs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/27</td>
<td>LAB PRACTICAL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Assessment

Assessment of the course will be in the form of 4 lecture exams, 2 lab practical exams, and 8 lab quizzes. The Laboratory component will make up 40% of your overall BIOL 221 grade. The lecture and laboratory components both count towards the final grade, and are not assessed as separate units.

### Lecture

<table>
<thead>
<tr>
<th>Exam</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>100 pts</td>
</tr>
<tr>
<td>Exam 2</td>
<td>100 pts</td>
</tr>
<tr>
<td>Exam 3</td>
<td>100 pts</td>
</tr>
<tr>
<td>Final Exam</td>
<td>300 pts</td>
</tr>
</tbody>
</table>

### Lab

<table>
<thead>
<tr>
<th>Practical Exam</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Exam 1</td>
<td>150 pts</td>
</tr>
<tr>
<td>Practical Exam 2</td>
<td>150 pts</td>
</tr>
<tr>
<td>Quizzes</td>
<td>80 pts</td>
</tr>
<tr>
<td>Participation</td>
<td>20 pts</td>
</tr>
</tbody>
</table>

**Total** 1000 pts

**Exams** will cover material presented in lecture and lab. Lecture exams (1, 2 and 3) and lab practical exams are non-cumulative and will test the material presented since the previous exam. The lecture final exam is a cumulative exam. Lab quizzes will cover material presented during the previous lab session.

**Your grades are not curved!** For students interested in health-related professions, please consider why this is important.

### Grade Policy

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100%</td>
</tr>
<tr>
<td>A-</td>
<td>90-92%</td>
</tr>
<tr>
<td>B+</td>
<td>87-89%</td>
</tr>
<tr>
<td>B</td>
<td>83-86%</td>
</tr>
<tr>
<td>B-</td>
<td>80-82%</td>
</tr>
<tr>
<td>C+</td>
<td>77-79%</td>
</tr>
<tr>
<td>C</td>
<td>73-76%</td>
</tr>
<tr>
<td>C-</td>
<td>70-72%</td>
</tr>
<tr>
<td>D+</td>
<td>67-69%</td>
</tr>
<tr>
<td>D</td>
<td>63-66%</td>
</tr>
<tr>
<td>D-</td>
<td>60-62%</td>
</tr>
<tr>
<td>F</td>
<td>0-59%</td>
</tr>
</tbody>
</table>

### Lecture Attendance

Your success in this course will depend on your attendance and study habits. Lectures will not necessarily cover introductory material or general information. Therefore, it is expected that you have read the assigned book chapter prior to attending lecture. The assigned book chapters should serve as an introduction to the topics to be discussed in lecture, and as a reference when studying the anatomical and physiological principles emphasized in lecture.
Lecture PowerPoints will be posted to OAKS, but these do not contain notes, only figures used during lecture. You are encouraged to take advantage of every opportunity outside of the lecture to study the course material, whether that involves participating in study groups, attending SI study sessions, or regularly attending office hours. Please consider these opportunities and incorporate them into your study habits!

**Lab Attendance**
Attendance at your registered lab meeting time is mandatory. You will sign into lab at the start of each session, and you will see your instructor to sign out of lab when you leave. Quizzes will be administered during the first 10 minutes of lab. Practical exams are timed and rotate through exam stations in order. If you are late to lab, or miss lab altogether, you will miss the opportunity to answer those questions at the missed quiz/exam stations. **Lab absences will incur a 30-point penalty.** You are allowed one absence (excused or unexcused) from lab without this penalty. Each lab you miss thereafter will incur a 30 point penalty, in addition to those points lost from missing lab quizzes (or practical exams!). Outside of the scheduled lab sections on Monday through Thursday, the lab will be open from 8am to 5pm on Friday of each week to allow additional time to study and learn the anatomy. You will record your use of the open lab on the sign in/out sheet.

**Student Conduct**
1. There is to be no talking during the lecture. If you have a question, please raise your hand prior to asking the question. While answering a student’s question, please remain quiet so that the student and other class members can hear the reply.
2. Remember, you are attending the lecture to learn, not to text-message, surf the internet, sleep, or distract the instructor or the other students.
3. Please turn off all cellular phones, tablets/laptops before entering the lecture. Bring a pen/pencil and paper; take notes, draw diagrams and become proficient illustrating the anatomy that underlies the physiological concepts!
4. Be prepared! Read the relevant sections in the assigned book chapters before coming to class and lab.
5. No form of academic dishonesty is acceptable. Dishonesty includes, but is not limited to: cheating on an exam; stealing exam questions; substituting one person for another at an exam; falsifying data; destroying, tampering with, or stealing a computer program or file; and plagiarizing (using as one’s own the ideas and writings of another).
   Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved. Incidents where the instructor determines the student’s actions are related more to a misunderstanding will be handled by the instructor.
   A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed by both the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file. Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board. Students should be aware that unauthorized collaboration -working together without permission- is a form of cheating. Collaboration during the completion of the quizzes or exams is NOT permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information stored on a cell phone), copying from others’ exams, fabricating data, and giving unauthorized assistance. Students can find the complete Honor Code and all related processes in the Student Handbook at [http://www.cofc.edu/generaldocuments/handbook.pdf](http://www.cofc.edu/generaldocuments/handbook.pdf)
6. If you have a documented disability than may require assistance, you will need to contact the Center for Disability Services for coordination of your academic accommodations. If the CDS will be involved in administering an exam, we request that you inform us in advance (e.g. the day before the exam is not acceptable). The CDS is located in the Lightsey Center in Suite 104. The CDS phone number is (843) 953-1431. For more information about disabilities, see [http://disabilityservices.cofc.edu](http://disabilityservices.cofc.edu).
7. No College of Charleston employee or student should be subject to unwelcome verbal or physical conduct. It is expected that students, faculty and staff will treat one another with respect. Individuals who violate this policy are subject to discipline up to and including termination and/or expulsion from the College and the possibility of civil and criminal prosecution.
Learning Objectives:

Week of 8/21
   Intro, Homeostasis
      Form determines function (Ch. 1.1)
      Overview of levels of biological organization (Ch. 1.2)
         Organ system overview (Fig. 1.3)
      Requirements for life (Ch. 1.3)
      Homeostasis (Ch. 1.4)
         Components of homeostatic control (Fig. 1.4)
      Negative (Fig. 1.5) and positive (Fig. 1.6) feedback mechanisms
      Anatomical position (Ch. 1.5; Fig. 1.7)
      Anatomical vocabulary (Table 1.2)

Week of 8/28
   Cell
      Cell theory (Ch. 3.1)
      Fluid mosaic model of the plasma membrane (Ch. 3.2)
         Phospholipids
         Glycolipids
         Cholesterol
      Membrane proteins (Ch. 3.2)
      Cell junctions
         Tight junctions
         Desmosomes
         Gap junctions
      Organelles (Ch. 3.7)
         Mitochondria
         Ribosomes
         Endoplasmic reticulum (rough and smooth)
         Golgi apparatus
         Peroxisomes
         Lysosomes
      Nucleus (Ch. 3.9)
         DNA (Fig. 3.27)
      RNA (Ch. 3.11)
         Transcription (Figs. 3.30, 3.31)
         Translation (Figs. 3.32, 3.33)

Tissues
   Four primary tissue types – epithelium, connective tissue, muscle, nervous.
   Epithelium (Ch. 4.2)
      Simple
         Squamous
         Cuboidal
         Columnar

Week of 9/4
   Tissues
   Epithelium (Ch. 4.2)
      Stratified
         Squamous
         Cuboidal
         Columnar
      Pseudostratified
      Transitional
   Connective tissue (Ch. 4.3; Fig. 4.8)
      Connective Tissue Proper
         Areolar
         Adipose
Dense regular and irregular CT
Cartilage
  Elastic
  Hyaline
  Fibrocartilage
Bone
Blood
Muscle (Ch. 4.4; Fig. 4.9)
  Skeletal
  Cardiac
  Smooth
Nervous tissue (Ch. 4.5; Fig. 4.10)
  Neurons
  Neuroglia
    Astrocytes
    Microglia
    Schwann cells and oligodendrocytes
    Ependymal cells

Week of 9/11

Inegumentary System
Layers of the skin (Ch. 5.1; Fig. 5.1)
  Epidermis (Ch. 5.2)
    Cells
      Keratinocytes
      Melanocytes
      Dendritic cells
      Tactile cells
    Layers (Fig. 5.2)
      Stratum basale
      Stratum spinosum
      Stratum granulosum
      Stratum lucidum
      Stratum corneum.
  Dermis (Ch. 5.3; Fig. 5.3)
    Papillary layer
    Reticular layer
Skin pigmentation (Ch. 5.4)
Structure of hair and the hair follicle (Ch. 5.5; Fig. 5.6)
Structure of nails (Ch. 5.6; Fig. 5.7)
Exocrine glands
  Eccrine sweat glands
  Apocrine sweat glands
  Sebaceous glands
Functions of the integumentary system (Ch. 5.8)
  Protection/immune
  Regulation of body temperature
  Cutaneous sensation
  Metabolism
  Blood reservoir
  Excretion

Week of 9/18

Bone - Structure
Intro to skeletal system, cartilages (Ch. 6.1)
Functions of bones (Ch. 6.2)
Axial and appendicular skeleton, classification of bone (Ch. 6.3)
Bone Structure (Ch. 6.4)
  Compact (cortical) bone
  Spongy (trabecular)
Structure of long bone (Fig. 6.4)
The osteon (Haversian system) (Figs. 6.7, 6.6)
Cells of bone tissue (Fig. 6.5)
Chemical composition of bone
Bone markings (Table 6.1)

Week of 9/25
Bone - Development/Growth
Bone development (Ch. 6.5; Figs. 6.8, 6.9)
Bone growth (Figs. 6.10, 6.11)
Bone remodeling (Ch. 6.6; Figs. 6.12, 6.13)
Repair of fractures (Fig. 6.14; Table 6.2).
Bone disorders (Ch. 6.8; Figs. 6.15, 6.16)

Week of 10/2
Skeleton, Joints
Classifications of joints (Ch. 8.1)
Synarthroses
Amphiarthroses
Diarthroses
Fibrous joints (Ch. 8.2)
Sutures (Figs. 8.1a, 7.5b, 7.4)
Syndesmoses (Figs. 8.1b; 7.29b&c, 7.34)
Gomphosis (Figs. 8.1c, 7.11, 23.12)
Cartilaginous joints (Ch. 8.3)
Synchondroses (Figs. 8.2a, 7.23a, 6.8, 6.11)
Symphyses (Figs. 8.2b, 7.17, 7.31)
Synovial joints (Ch. 8.4)
Structure (Figs. 8.3, 8.4)
Movements (Figs. 8.5, 8.6)
Types (Ch. 8.5; Focus Figure 8.1)
Joint injuries and disorders (Ch. 8.6; Figs. 8.13, 8.14)

Week of 10/9
Excitable Cell Physiology
Passive and active transport
Diffusion (Ch. 3.3; Figs. 3.6, 3.7)
Fick’s Law of Diffusion
Osmosis (Figs. 3.8, 3.9)
Na⁺/K⁺ ATPase (Ch. 3.4; Focus Figure 3.1).
Excitable cells
Resting membrane potential (Ch. 3.5, Ch. 11.4; Fig. 3.14; Focus Figure 11.1)
Nernst Equation
Goldman-Hodgkin-Katz Equation

Week of 10/16
Excitable Cell Phys - Neuron, Graded Potentials and Action Potentials
Graded Potentials (Ch. 11.5; Figs. 11.9 and 11.10)
Action Potentials (Ch. 11.6; Focus Figure 11.2; Fig. 11.11)
Synapse (Ch. 11.7; Focus Figure 11.3)
Refractory Periods (Fig. 11.13)
Encoding (Fig. 11.12)

Week of 10/22
Muscle - Skeletal
Review of muscle tissue (Ch. 9.1)
Organization of skeletal muscle (Ch. 9.2; Fig. 9.1; Table 9.1)
Micro-structure and sliding filament theory (Ch. 9.3; Figs. 9.2, 9.3, 9.4, 9.6)
Muscle stimulation (Ch. 9.4; Focus Figure 9.1; Figs. 9.8, 9.9)
Excitation-Contraction coupling (Figs. 9.5, 9.7; Focus Figure 9.2)
Contraction (Focus Figure 9.3)

Week of 10/30
Muscle – Skeletal
Wave summation and motor unit recruitment (Ch. 9.5)
Muscle twitch
Summation (Figs. 9.11, 9.12)
Motor units (Fig. 9.10)
Recruitment (Figs. 9.12 and 9.14)
Factors that affect maximum muscle performance (Ch. 9.7; Figs. 9.18, 9.19, 9.20, 9.21; Table 9.2).
How muscles are named (Ch. 10.2)
Fascicle arrangements (Ch. 10.3; Fig. 10.1)
Motor units (Fig. 9.10)
Recruitment (Figs. 9.12 and 9.14)
Factors that affect maximum muscle performance (Ch. 9.7; Figs. 9.18, 9.19, 9.20, 9.21; Table 9.2).
How muscles are named (Ch. 10.2)
Fascicle arrangements (Ch. 10.3; Fig. 10.1)
Muscle actions (Focus Figure 10.1)
Lever systems (Ch. 10.4; Fig. 10.3)

Week of 11/6
Muscle – Cardiac and Smooth
Smooth Muscle (Ch. 9.9; Figs. 9.22, 9.23, 9.24, 9.25)
Cardiac Muscle (Ch. 18.4, Ch. 18.5; Table 18.1)
Micro-anatomy (Fig. 18.11)
Autorhythmic myocardium (Fig. 18.12)
Contractile myocardium (Fig. 18.5)
Excitation-contraction coupling

Week of 11/13
Metabolism
Metabolic pathways and muscle performance (Ch. 9.6; Figs. 9.16, 9.17)
Fatigue
Excess post-exercise oxygen consumption (EPOC)
Metabolism
Anabolism and catabolism (Ch. 24.3; Fig. 24.3)
ATP synthesis (Ch. 24.4; Figs. 24.4, 24.5)
glycolysis (Fig. 24.6)
Krebs cycle (Ch. 24.7)
Electron transport chain (Focus Figure 24.1; Figs. 24.8, 24.9, 24.10)
Glycogenesis/glycogenolysis (Fig. 24.13)
Lipid metabolism (Figs. 24.16, 24.15)
Protein metabolism (Figs. 24.17, 24.19)

Week of 11/20
Endocrine System
Endocrine overview (Ch. 16.1; Fig. 16.1)
Chemical structure of hormones (Ch. 16.2)
Mechanisms of action (Ch. 16.3)
Secondary messenger system (Fig. 16.2)
Direct gene activation (Fig. 16.3)
Endocrine stimuli/control (Ch. 16.4; Fig. 16.4)
Stimuli
Humoral
Neural
Hormonal
Positive vs negative feedback loops
Hormone interactions
Permissiveness
Synergism
Antagonism
Hypothalamus and pituitary gland (Ch. 16.6; Focus Figure 16.1; Table 16.2)
Regulation of Growth Hormone (Fig. 16.5)
Endocrine System

Thyroid
- Regulation of Thyroid Hormone (Figs. 16.7, 16.8, 16.9; Table 16.3)
- Regulation of Calcitonin

Parathyroid
- Regulation of Parathyroid hormone (Figs. 16.11, 16.12)

Adrenal gland hormones
- Regulation of Water Volume and Blood Pressure
  - Anti-diuretic hormone (ADH)
  - Regulation of aldosterone (Fig. 16.4)
    - Humoral control
    - Renin-angiotensin pathway
    - ACTH
    - Atrial natriuretic peptide
- Pancreas and regulation of blood glucose (Ch. 16.11; Figs. 16.17, 16.18, 16.19)
  - Insulin
  - Glucagon
  - Type 1 vs Type 2 Diabetes.

Parturition (Ch. 28.16)