BIOL 160: Human Anatomy

Instructor: Jennifer Ruiz

Lecture Time: Online + Saturdays June 13th to August 8th from 8AM to 10AM
Lab Time: Saturdays June 18th to August 8th from 10AM to 12PM

Course Syllabus

Course Description
Human Anatomy is the integrated study of the gross and microscopic anatomy of the human body. At the end of the course students will have an understanding of the human architecture and how the microscopic and gross forms adhere to the concept of “shape/organization confers function”. Prerequisite: One semester of college biology. This course includes eight laboratory sessions.

Course Goals
The goal of this course is to provide undergraduate students with:

- a review of the basic concepts of their introductory biology course and reveal how those fundamental ideas play a crucial role in understanding the body’s architecture, organization, and function
- the interdisciplinary nature of the natural sciences. Mathematics provides the foundation for Physics → Chemistry → Biology → Human Anatomy.
- the Laws of Thermodynamics and how energy is crucial to the human body’s complex architecture (shape/organization).
- the understanding of “shape/organization confers function” a molecular point of view to gross anatomy. The idea that one cell, one organelle, or even one macromolecule can have profound effects on the entire human body.
- the basic hierarchy, function, and different diseases for each organ system within the human body.

Student Expectations

Lectures will be delivered asynchronously as videos recorded by faculty to be accessible by students on-line through Google Drive at Keck Graduate Institute at their convenience. Additional course materials including readings, grades, and assignment will be made available through the Learning Management System Sakai. Students are responsible for watching video lectures during the week at their own pace. Students are required to come to KGI on Saturdays for discussion of the week’s topic(s) as well as to participate in a 3D virtual Human Anatomy Lab using Z-Space® technology housed at KGI.

Exams and quizzes will be given electronically at the discretion of the instructor. Laboratory periods will be conducted for 4 hours on Saturday’s for 8 weeks over the summer session excluding the July 4th holiday.

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Student Learning Outcomes

Test #1
The directions and planes of the body.
All cavities of the body and general organization of the main organs.
Cell structures and organelles and their function.
Mechanisms of transport across the cell membrane.
Detailed mechanisms of mitosis, meiosis, transcription, and translation
Terminology/clinical terms with medical applications.
Tissue location and identification within the human body.
Understand the process of memorization.
Know all regions in regards to surface anatomy.

Test #2
Structures and functions of the skin.
Mechanism of sweating explained through the laws of thermodynamics.
Potential mechanisms for the development of skin cancer.
Major bones in the axial and appendicular skeleton.
Bone markings, microstructure and development.
Process of ossification.
Five principle bone cells and their role in maintenance a fracture repair.
Principles of Articulation of the major joints.
Know all the types of synovial joints.
Know all the movements at the synovial joints.

Test #3
1. Understand the functional organization of the nervous system.
2. Cytology of the nervous system.
3. The importance of glial cells. The good, the bad, and the ugly.
4. Mechanism of neurotransmission
5. Mechanism of synapses.
6. Identifying and describing nerves, structures of the brain, spinal cord, peripheral, autonomic nervous system and the senses.
7. Identify portions of the brain that lead to different disease states and potential mechanisms.
8. Know the location, function, mechanisms involved in regulation via the endocrine glands.
10. Understand the organization levels of the skeletal muscles.
11. Identifying the origin, insertion and action of skeletal muscles.
12. Memorize the gross anatomy of the major axial and appendicular skeletal muscles.
13. Understand the sliding filament theory.
14. Understand the neuromuscular junction.
15. Understand skeletal muscle architecture.
16. Give examples of the different levers and joint biomechanics.

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Test #4
1. Components of blood and their respective functions.
2. Understand blood typing.
3. The concept of cooperative binding in regards to oxygen and carbon dioxide exchange/transport.
4. Identify the heart, blood vessels and related structures.
5. Understand the mechanisms of pulmonary and systemic circulation.
6. Be able to interpret an electrocardiogram.
7. The hearts conducting system and how it relates to the “lub – dub” sound the heart makes.
8. Steps of the cardiac cycle.
9. Be able to describe the blood flow through the heart.
10. Know the mechanisms of varicose veins, atherosclerosis, strokes, and heart attacks.
    What can you do to prevent them?
11. Identify the major components of the lymphatic system.
12. Know the types and functions of the lymphocytes.
13. Identifying the respiratory structures.
14. Understand the effects of smoking.
15. Mechanisms of cystic fibrosis.
16. Be able to describe pulmonary ventilation.
17. Describe the mucociliary mechanism.
18. Defend the different epithelial tissues located in the different zones of the respiratory system.
19. Identifying the structures associated with the digestive system
20. Be able identify the specific organs and breakdown the mechanisms that allow them to provide their particular function and the outcomes/diseases when they do malfunction.
21. Name and locate the structures associated with the urinary system.
22. Understand the process of urine formation
23. Identify and describe the functions of all the different components of the nephron.
24. Identify and describe the structures associated with the male and female reproductive systems.
25. Explain the female menstrual cycle and discuss the interactions between the endocrine and nervous system.
26. Explain how growth, development, and aging of tissue occur in the human from conception to death.

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Evaluation
The student must demonstrate competency on 4 tests. There will be no make-up exams will be given

Point distribution will be approximately as follows:
- Tests 400
- Lab Tests ~200
- Laboratory ~250
- Pop Quizzes ~ 50
- Total 900 points

Required Texts:
2. Z Scape Lab Manual

Cheating, plagiarism, and facilitation of either one will not be tolerated and will result in an immediate F for the course.
### Tentative Course Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Discussion Title</th>
<th>Reading (Chapter)</th>
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</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Terminology/ Organization</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Cellular anatomy</td>
<td>2</td>
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<tr>
<td></td>
<td>Histology</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Surface anatomy</td>
<td>13</td>
</tr>
<tr>
<td>Week 2</td>
<td>Integument</td>
<td>5</td>
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<tr>
<td></td>
<td>Skeletal System</td>
<td>6/7</td>
</tr>
<tr>
<td></td>
<td><strong>TEST #1</strong></td>
<td><strong>1,2,13 &amp; 4</strong></td>
</tr>
<tr>
<td></td>
<td>Skeletal System</td>
<td>7/8</td>
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<tr>
<td></td>
<td>Articular System</td>
<td>9</td>
</tr>
<tr>
<td>Week 3</td>
<td>Nervous</td>
<td>14 &amp; 15</td>
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<tr>
<td></td>
<td>Nervous</td>
<td>16 &amp; 17</td>
</tr>
<tr>
<td>Week 4</td>
<td><strong>TEST #2</strong></td>
<td><strong>5,6,7,8 &amp; 9</strong></td>
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<tr>
<td></td>
<td>Senses</td>
<td>19</td>
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<tr>
<td></td>
<td>Endocrine System</td>
<td>20</td>
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<tr>
<td>Week 5</td>
<td>Muscles</td>
<td>10, 11, &amp; 12</td>
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<td></td>
<td>Circulatory/Lymphatic System</td>
<td>21,22 &amp; 24</td>
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<tr>
<td>Week 6</td>
<td><strong>TEST #3</strong></td>
<td><strong>14,15,16,17,19,20,10,11 &amp; 12</strong></td>
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<tr>
<td></td>
<td>Respiration</td>
<td>25</td>
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<tr>
<td>Week 7</td>
<td>Digestion</td>
<td>26</td>
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<td></td>
<td>Urinary System</td>
<td>27</td>
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<td>Reproductive System</td>
<td>28</td>
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<tr>
<td>Week 8</td>
<td><strong>Final</strong></td>
<td><strong>21,22,24,25,26,27 &amp; 28</strong></td>
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### Laboratory Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Discussion Title</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Lecture Review &amp; Lab Introduction</td>
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<tr>
<td></td>
<td>Histology</td>
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<tr>
<td>Week 2</td>
<td>Histology &amp; Skeletal System</td>
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<tr>
<td>Week 3</td>
<td>Articular &amp; Integumentary System</td>
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<td></td>
<td><strong>Practical Exam (Weeks 1 &amp; 2)</strong></td>
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<tr>
<td>Week 4</td>
<td>Nervous system-spinal cord &amp; nerves</td>
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<td></td>
<td>Senses &amp; Endocrine</td>
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<td>Week 5</td>
<td>Muscles- lower extremity</td>
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<td></td>
<td>Muscles- upper extremity</td>
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<tr>
<td>Week 6</td>
<td>Circulatory System</td>
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<tr>
<td></td>
<td>Respiratory System</td>
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<td>Digestive System</td>
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<td></td>
<td>Urinary System</td>
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<td>Week 7</td>
<td><strong>Practical Exam Cumulative</strong></td>
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I. **Week 1**: Lecture Review, Lab Introduction and Histology  
   The lecture review is lab time allotted to ensure students understand the connections between gross anatomy and microscopic/molecular anatomy. The lab introduction will expose the students to all the capabilities that the Zspace 3D dissection program possesses. Students will be taught to break down the human body from the organismal level to the molecular level (gross to microscopic/molecular anatomy) as they utilize the Zspace program and view histological slides simultaneously.  
   **Material**  
   - Zspace computer introduction (how to maximize the 3D system)  
   - Histological slides

II. **Week 2**: Histology and Skeletal System  
   The ability to understand the human body from a gross and molecular perspective will be reinforced. This week will primarily focus on different pedagogies of memorizing the skeletal system. At the end of this week students will create a pseudo practical to prepare them for next week’s actual practical.  
   **Stations**  
   - Histological slides  
   - Zspace will provide the gross dissection and different methodologies to help students memorize different bones and the macro structures  
   - Bone models  
   **Material**  
   - Zspace computer  
   - Histological slides  
   - Bone model

III. **Week 3**: Articular & Integumentary System

Syllabus is subject to change at the professor’s discretion. Students will be informed of changes 5 days prior to changed due dates.
Practical exam will be administered. The skeletal system, which was studied last week, is capable of movement due to the different articulations. The main joints will be dissected while the models will provide a kinesthetic experience. The integumentary system will be portrayed from a histological perspective.

**Stations**
- Histological slides
- Zspace will provide the gross dissection and different methodologies to help students memorize different joint structures
- Synovial joint models

**Material**
- Zspace computer
- Histological slides
- Synovial joint model

### IV. Week 4: Nervous system, endocrine system, and senses

The nervous system is subdivided into different subsystems, to organs and finally to specific regions. Students are expected to identify the main organs of the endocrine system and the specific structures of the eye and ear. This week will be the first one that implements the exit exam. Students are expected to take an exit exam (graded mini practical) before leaving. This expectation will occur for the next two weeks.

**Stations**
- Histological slides
- Zspace will provide the gross dissection and different methodologies to help students memorize different organs and macro structures of the nervous system, endocrine system, eye, and ear.
- Brain model
- Eye model
- Ear model

**Material**
- Zspace computer
- Histological slides
- Brain model
- Eye model
- Ear model

### V. Week 5: Muscles

All skeletal muscles will be dissected. The

**Stations**
- Histological slides
- Zspace will provide the gross dissection and different methodologies to help students memorize the different muscles.
- Upper torso model

**Material**
- Zspace computer

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VI. Week 6: Circulatory, respiratory, digestive and urinary system
All skeletal muscles will be dissected. The

Stations
Histological slides
Zspace will provide the gross dissection and different methodologies to help students memorize the different parts of the: circulatory, respiratory, digestive and urinary system.
Upper torso model
Heart model
Kidney/nephron model

Material
Zspace computer
Histological slides
Upper torso model
Heart model
Kidney/nephron model

VII. Week 7: Cumulative Practical

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