



Perris Union High School District

Course of Study

A. COURSE INFORMATION

<p>Course Title: (limited to 34 characters with spaces in Infinite Campus)</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Honors Human Body Systems</div> <p><input type="checkbox"/> New <input checked="" type="checkbox"/> Revised</p> <p>If revised, the previous course name if there was a change</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">PLTW Honors Human Body Systems</div> <p>Transcript Course Code/Number:</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">604401 / 604402</div> <p>(To be assigned by Educational Services if it's a new course)</p> <p>CREDIT TYPE EARNED: CALPADS CODE:</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px; display: flex; justify-content: space-between;"> 9222-08 </div> <p>Was this course <u>previously approved by UC for PUHSD?</u></p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Will be verified by Ed Services)</p> <p>Which A-G Requirement does/will this course meet?</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px; display: flex; justify-content: space-between;"> D Lab Science <input type="checkbox"/> Pending </div> <p>Submitted by: Jennifer West Site: PVHS Science Date: 2/14/24 Email: jennifer.west@puhsd.org</p>	<p>Subject Area:</p> <p><input type="checkbox"/> Social Science <input type="checkbox"/> English <input type="checkbox"/> Mathematics <input checked="" type="checkbox"/> Laboratory Science <input type="checkbox"/> World Languages <input type="checkbox"/> Visual or Performing Arts <input type="checkbox"/> College Prep Elective <input type="checkbox"/> Other</p> <p>Is this classified as a Career Technical Education course?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If yes, which pathway does this course align to? Pathway Name:</p> <div style="border: 1px solid black; height: 20px; margin-bottom: 5px;"></div> <p>CTE CDE Code:</p> <div style="border: 1px solid black; height: 20px; margin-bottom: 5px;"></div> <p>Credential Required to teach this course: <i>To be completed by Human Resources only.</i></p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Single Subject: Science; Biological Sciences; Health Science </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; display: flex; justify-content: space-between;"> <div style="text-align: center;"> Signature. </div> <div style="text-align: center;"> 2/26/2024 Date </div> </div> <p>Unit Value/Length of Course:</p> <p><input type="checkbox"/> 0.5 (half-year or semester equivalent) <input checked="" type="checkbox"/> 1.0 (one-year equivalent) <input type="checkbox"/> 2.0 (two-year equivalent) <input type="checkbox"/> Other:</p>	<p>Grade Level(s)</p> <p><input type="checkbox"/> MS <input type="checkbox"/> HS <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input checked="" type="checkbox"/> 11 <input checked="" type="checkbox"/> 12</p>
<p>Approvals</p> <p>Director of Curriculum & Instruction</p> <p>Asst. Superintendent of Educational Services</p> <p>Governing Board</p>	<p>Name/Signature</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;"> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;"> </div>	<p>Date</p> <p style="text-align: center; font-size: 1.2em;">3/4/24</p>

Prerequisite(s) (REQUIRED):
Principles of Biomedical Science (C or better) Biology (C or better)
Corequisite(s) (REQUIRED):
Chemistry
Brief Course Description (REQUIRED):
<p>Honors Human Body Systems (HBS) is a full-year high school course designed to follow Principles of Biomedical Science in the Biomedical Science pathway. The HBS course provides foundational knowledge and skills in anatomy and physiology, clinical medicine, and laboratory research. The course engages students in how this content can be applied to real-world situations, cases, & problems. The HBS course includes interviews, challenges, and testimonials from biomedical professionals in a variety of settings—clinical, research, and public health.</p> <p>Through both individual and collaborative team activities, projects, and problems, students tackle real-world challenges that biomedical professionals face in the field. Students work with the same tools and equipment used in hospitals and labs as they engage in relevant hands-on work. They explore BioDigital™ 3D interactive models, simulations, and assessments to visualize human anatomy and physiology. Students develop skill in technical documentation to represent and communicate experimental findings and solutions to problems, as well as skill in ethical reasoning and clinical empathy.</p>

B. COURSE CONTENT

Course Purpose (REQUIRED):

What is the purpose of this course? Please provide a brief description of the goals and expected outcomes. Note: More specificity than a simple recitation of the State Standards is needed.

Unit 1: Road to Rehabilitation

In this unit, students join a dynamic team of biomedical professionals dedicated to helping patients with illness or injury progress through rehabilitation, getting them back to doing what they love. Students explore the human skeletal and muscular systems as they gain the knowledge and skills they need to design a solution for their assigned patient—involving physical rehabilitation, assistive devices, and overall strategies for physical and mental well-being. Throughout the unit, students gather medical evidence and information about their patient and use what they learn along the way to help them develop a comprehensive health and wellness plan for the patient.

Unit 1 Lessons

- Lesson 1.1 - Beginning with Bones
- Lesson 1.2 - Muscles and Motion
- Lesson 1.3 - Relief Within Reach

Unit 2: Research Ready

In this unit, students have accepted an internship at the Development and Aging Research Center at a local university. The researchers in this lab are especially interested in exploring how the brain and other parts of the nervous system change as a person ages and how the endocrine system controls how a person's body carries out various processes. The research findings of this lab will inform innovations, treatments, and strategies to improve the quality of life and longevity for people around the world. Students explore the various labs at the research center through a virtual gaming environment. They gather advice from career professionals and design experiments and research projects. Students are tasked to acquire the knowledge and skills they will need to gain access to the main research laboratory, which is dedicated to solving problems that help unlock the mysteries of the communication network in the body—the nervous and endocrine systems.

Unit 2 Lessons

Lesson 2.1 - Getting Nervous

Lesson 2.2 - Everything Endocrine

Lesson 2.3 - Challenge Accepted

Unit 3: Adventure Awaits

In this unit, students join a team of expedition leaders who escort adventure travelers through a series of activities and events in extreme or remote environments. They are tasked to ensure the health and wellness of their group—focusing on the cardiovascular, respiratory, and immune systems—as they identify and address health risks or challenges travelers may encounter in these environments. They investigate pathogens native to an assigned environment and interventions to prevent and treat those pathogens. Students use what they have learned to work together to respond to an emergency medical incident that happens on an adventure trip, presented in an interactive simulation.

Unit 3 Lessons

Lesson 3.1 Cardiopulmonary Connection

Lesson 3.2 Body Guards

Lesson 3.3 Adventure Medicine

Unit 4: Patient Perspectives

In this unit, students are biomedical science advisors working on the development of an interactive exhibit. In and Out of the Body: Patient Perspectives will combine art and storytelling into an immersive experience that spotlights the stories of real patients to investigate the structure and function of the urinary and digestive systems.

Unit 4 Lessons

Lesson 4.1 - Keeping it Renal

Lesson 4.2 - It Takes Guts

Lesson 3.3 - Engage in the Exhibit

Course Outline (REQUIRED):

Detailed description of topics covered. All historical knowledge is expected to be empirically based, give examples. Show examples of how the text is incorporated into the topics covered.

Unit 1: Road to RehabilitationLesson 1.1 - Beginning with Bones

In Lesson 1.1, students meet five patients with medical conditions or injuries that need physical therapy or rehabilitative care. As they explore the medical history of the patient, students practice the language of anatomy, using directional and regional terms and terms for body cavities and planes, to reference the injury or condition. Students investigate tissues of the human body, focusing on the structure and function of bone. They will use their knowledge of the skeletal system to analyze a patient's fracture and explore biomechanical engineering solutions to repair this fracture.

1.1 Labs: Skeletal Histology (Microscope Lab), Fracture Analysis and Repair

Lesson 1.2 - Muscles and Motion

In Lesson 1.2, students model the physiology of muscle contraction as they assist a patient suffering from chronic muscle cramps. They build muscles on a Maniken® skeletal model, demonstrating how the orientation of a muscle relates to the role the muscle plays in the body and how a patient's muscles are impacted in injury or illness. They use physiology sensors and probes to monitor muscle strength and design an experiment to test muscle fatigue. To help a patient with a knee injury, students measure and analyze range of motion of the joints, perform diagnostic tests on a dynamic knee model, and practice kinesiology taping techniques guided by an athletic trainer.

1.2 Labs: Manikin Muscle Build, Gross Anatomy of Skeletal Muscle Modeling Lab, Microanatomy of Skeletal Muscle Modeling Lab, Grip Strength Lab, Knee Joint Modeling Lab, Range of Motion Lab

Lesson 1.3 - Relief Within Reach

Now that students have studied the skeletal and muscular system, they are ready to design a comprehensive solution for their patient in the outpatient center. To create a personalized care and rehabilitation plan to give to the patient, their caregivers, and future healthcare providers, students analyze the patient's medical data available in a patient medical portal along with the data they have collected in the unit. Students consider and demonstrate the importance of empathy and respect in patient care as they design a plan to help the patient manage their condition, progress forward, and maintain the activities and lifestyle they love.

1.3 Labs: N/A

Unit 2: Research ReadyLesson 2.1 - Getting Nervous

Students begin their first day as interns at the Development and Aging Research Center. Over the course of the lesson, students tour the facility through a 3D gaming environment, dissect a sheep brain to visualize the connection between structure and function, complete a virtual lab to evaluate the impact of specific drugs on signaling of neurons, and use physiological sensors to compare reflex and reaction time. At the end of the lesson, students participate in a Lab Leads Challenge where they apply what they have learned to diagnose a patient and model how their condition is linked to the function of the nervous system.

2.1 Labs: Sheep Brain Dissection, Reflex Response Time Lab

Lesson 2.2 - Everything Endocrine

In this lesson, students enter the Endocrinology Lab to research the role the endocrine system plays in the development of the human body. To examine feedback loops and how the endocrine system helps the body maintain homeostasis, students stimulate hormone action in a role-play game. This game uses blood sugar and insulin as the models for hormone regulation, which students map on a graphic organizer.

Students then work in the lab with a model organism, *C. elegans*, designing and running experiments to explore the impact of neurotransmitters and hormones on body function. Students explore scientific literature as they assist a colleague in preparing a poster presentation related to reproductive regulation. At the end of the lesson, they meet a new set of patients, analyze their conditions, and decide what laboratory testing each patient needs to help support a final diagnosis.

2.2 Labs - *C. Elegans* Neurotransmitters & Hormones Lab

Lesson 2.3 - Challenge Accepted

In the problem, students complete an open-ended research experiment with the model organism, *C. elegans*, to see how heavy metals affect the nervous and endocrine systems. They design an investigation of their choosing, run the experiment with their team, and analyze data to make conclusions.

2.3 Labs - *C. Elegans* Heavy Metals Lab

Unit 3: Adventure Awaits

Lesson 3.1 - Cardiopulmonary Connection

Lesson 3.1 introduces students to their new role as adventure guides for an expedition company. Through the engaging lens of adventure medicine, students investigate the cardiovascular and respiratory systems. Students explore the movement of blood to our organs and tissues, build the heart and major blood vessels on their Maniken® model, perform cardiovascular measurements and calculations, and then learn how to record and interpret EKGs.

They investigate the connection between the cardiovascular and respiratory systems through a sheep pluck dissection, diagnose a fictional patient with respiratory issues, and use spirometry to measure lung volumes and flow rates. Finally, students apply all they've learned to analyze the cardiovascular and respiratory data of fictional clients and then make a recommendation as to whether they should be cleared for a climbing expedition.

3.1 Labs - Human Heart Modeling Lab, EKG Lab, Sheep Pluck Dissection, Lung Volumes & Capacities Lab (Spirometry)

Lesson 3.2 - Body Guards

Students continue their work with the expedition company as they explore the systems, structures, and cells that function to protect the body from illness and injury. They investigate agents of disease and how the human body works to fight against invaders. They play a Roblox® game designed to teach them how the specific immune cells function in response to infection by viruses and bacteria. Students complete a plaque assay in the lab to evaluate the effectiveness of antiviral medicines. They dissect a cow eye to investigate conditions of the eye that can be an issue on adventure expeditions.

3.2 Labs - Immune System Modeling Lab, Cow Eye Dissection

Lesson 3.3 - Adventure Medicine

In the problem, students use an interactive to design an expedition, choosing the destinations and activities, and then prepare a guide to help keep travelers healthy on this journey. Their guide must address the impacts of their assigned environment on human physiology—specifically the cardiovascular, respiratory, and immune systems. They must identify and address health risks of the extreme environment, as well as the risks related to pathogens native to the chosen location. Through an interactive experience, student teams are faced with an emergency on their trip. Using the guide they created, they work together to apply what they have learned to help their clients through the emergency and maintain the health and well-being of all adventurers on the expedition.

3.2 Labs - N/A

Unit 4: Patient Perspectives

Lesson 4.1 - Keeping it Renal

In Lesson 4.1, students hear from a kidney donor and a kidney recipient as they explore how the body filters the blood and processes liquid waste. They dissect both normal and abnormal kidneys to map filtration and determine impacts of cysts on overall kidney function. They build a 3D model nephron and complete a laboratory experiment to model kidney function. Students gain an appreciation for how changes in clinical algorithms and medical evaluation criteria highlight the push for equitable care to all patients. Students use gel electrophoresis to explore the genetics and inheritance of polycystic kidney disease. Finally, students complete simulated urinalysis, allowing them to see that clues in the urine may signal problems in other human body systems. They will tell the stories of these patients while creating a unique patient perspective asset for the exhibit.

4.1 Labs - Urinary System Maniken Build, Pig Kidney Dissection, Nephron Modeling Lab, DNA Gel Electrophoresis, Urinalysis Lab

Lesson 4.2 - It Takes Guts

In this lesson, students experience the story of a young woman who has had a full digestive system transplant. As they follow her case and hear about her journey, students model the digestive system on their Maniken® model and explore microscopic images of digestive tissue. They investigate gut health - how microbes play a role in healthy digestion - and how diagnostic tests are used to detect disease. In the project, students complete laboratory tests to investigate how enzymes function in the breakdown of food and relate the results of these experiments to digestive conditions.

4.2 Labs - Digestive System Maniken Build, Factors Affecting Enzyme Action Lab

Lesson 4.3 - Engage in the Exhibit

In the problem, student teams are challenged to design and storyboard an interactive element for the exhibit that allows visitors to apply their knowledge of biomedical science to investigate a medical story. They are tasked with providing a new patient perspective to showcase key science and using art and media to engage their audience.

4.3 Labs - N/A

Writing Assignments (REQUIRED):*Give examples of the writing assignments and the use of critical analysis within the writing assignments.*

- Students will maintain a formal laboratory notebook and career journal.
- Technical writing will consist of formal lab reports and case reports. Reports will include background research with properly cited primary sources, analyzed experimental data, discussion, and a conclusion.

INSTRUCTIONAL MATERIALS (REQUIRED)**Textbook #1 - None**

Title:

Edition:

Author:

ISBN:

Publisher:

Publication Date:

Usage:

- Primary Text
 Read in entirety or near

Textbook #2 - None

Title:

Edition:

Author:

ISBN:

Publisher:

Publication Date:

Usage:

- Primary Text
 Read in entirety or near

Supplemental Instructional Materials *Please include online, and open source resources if any.*

1. OpenStax Anatomy & Physiology Online Textbook:
<https://openstax.org/details/books/anatomy-and-physiology-2e>
2. Get Body Smart Interactive Anatomy & Physiology website: <https://www.getbodysmart.com/>
3. Visible Body Learn Site: <https://www.visiblebody.com/learn/>
4. Ted Ed Video Collection - Getting Under Our Skin:
https://ed.ted.com/ted_ed_collections/getting-under-our-skin

Estimated costs for classroom materials and supplies (REQUIRED). *Please describe in detail.*

If more space is needed than what is provided, please attach a backup as applicable.

Cost for a class set of textbooks: \$0

Description of Additional Costs:

Additional costs: Estimated \$5000 per 36 students	Lab and activity supplies
Total cost per class set of instructional materials:	\$5000

Key Assignments (REQUIRED):

Please provide a detailed description of the Key Assignments including tests, and quizzes, which should incorporate not only short answers but essay questions also. How do assignments incorporate topics? Include all major assessments that students will be required to complete

- Group presentations
- Case study analysis
- Graphic organizers
- Lab notebooks
- Lab practicum
- Projects
- Lab or case reports
- Lesson quizzes
- Unit exams

Instructional Methods and/or Strategies (REQUIRED):

Please list specific instructional methods that will be used.

- Collaborative groups work
- Hands-on laboratory experiments
- Virtual simulations
- Experimental design
- Modeling
- Role playing
- Graphing
- Direct interactive instruction
- Note taking
- Issue-based inquiry
- Group discussions
- Debate
- Group presentations

Assessment Methods and/or Tools (REQUIRED):

Please list different methods of assessments that will be used.

- Group presentations
- Individual and group projects
- Lab notebooks
- Lab practicum
- Lab or case study reports
- Lesson quizzes

- Unit exams
- Comprehensive final exam

COURSE PACING GUIDE AND OBJECTIVES (REQUIRED)

Day(s)	Objective	Standard(s)	Chapter(s)	Reference
16	Lesson 1.1 Beginning with Bones	See HBS Course Framework		
22	Lesson 1.2 Muscles and Motion			
5	Lesson 1.3 Relief Within Reach			
22	Lesson 2.1 Getting Nervous			
16	Lesson 2.2 Everything Endocrine			
6	Lesson 2.3 Challenge Accepted			
20	Lesson 3.1 Cardiopulmonary Connection			
12	Lesson 3.2 Body Guards			
5	Lesson 3.3 Adventure Medicine			
19	Lesson 4.1 Keeping it Renal			
12	Lesson 4.2 It Takes Guts			
5	Lesson 3.3 Engage in the Exhibit			

C. HONORS COURSES ONLY

Indicate how much this honors course is different from the standard course.

The honors course involves conducting the “optional” laboratory experiments that are part of the curriculum in order to give students more hands-on, practical experience with using professional laboratory equipment. Students will be required to design experiments and communicate their findings in formal lab reports. Students will also be required to take the comprehensive final exam.

The honors course also includes a cumulative final project which focuses on the connection between all of the human body systems and examines how these systems work together to maintain health and homeostasis. Students will explore how the body deals with extreme external environments as well as how the body reacts to and defends against injury and illness. Students will begin to discuss and design medical interventions and will use the activities in this lesson as engagement for the subsequent course.

D. BACKGROUND INFORMATION

Context for course (optional)

The following outlines the skills and content knowledge students are expected to obtain in the Honors Human Body Systems course. It includes computational and analytical skills as well as technical skills that come from experience with tools, software, lab work, and engineering design. This detailed list of skills and knowledge illustrates the immediate, applicable contributions that HBS students can make within a workplace.

Laboratory Skills

- Micropipetting
- DNA gel electrophoresis
- Restriction digestion
- Dissection
- Aseptic technique
- Plaque assay

Clinical Medicine

- EKG analysis
- Spirometry
- Urinalysis
- Evaluation of circulation - ankle brachial index (ABI)
- EMG analysis
- Taking and interpreting vital signs
- Diagnostic image analysis
- Kinesiology evaluation and taping
- Fracture repair techniques
- Tissue histology
- Physical therapy

Equipment and Software Proficiencies

- Vernier physiology sensors and probes
- Data acquisition software (Vernier® Graphical Analysis® 4)
- Microscope
- Goniometer

Scientific Experimentation Skills

- Locating, reading, and summarizing research presented in scientific journals
- Scientific experiment design and facilitation
- Laboratory data analysis and interpretation
- Graphing (by hand and using online tools)
- Analysis of experimental data to draw conclusions.
- Communication of results and conclusions orally and in writing
- Error analysis

Professional Skills

- Teamwork, group collaboration, and conflict resolution
- Project management
- Problem solving
- Technical writing
- Verbal and written communication
- Critical and creative thinking
- Ethical reasoning

Course Knowledge

- Biomedical science careers
- Structure and function of all human body systems
- Language of anatomy – regional and directional terminology
- Maintenance of homeostasis and feedback regulation
- Exercise physiology
- Mechanisms of pharmacologic action
- Movement at joints
- Muscle contraction
- Cardiac cycle and gas exchange
- Reflex and voluntary action
- Action potential and signal transduction
- Eye anatomy and physiology
- Human immunity and pathogen defense
- Hormonal regulation
- Enzyme action in digestion
- Nephron action
- Gut microbes and health
- Inheritance of genetic disease

Engagement Experiences

- Laboratory investigations
- Case studies
- Instant challenges and Quick Clinics
- Simulations
- Role play
- Gaming
- Design challenges

History of Course Development (optional)

The Human Body Systems course was first approved in 2014. In 2021, it was revised to be designated as an Honors level course. The current revision reflects a major curriculum update as well as an update to its prerequisites and corequisites. It also serves to update the title and make the course more accessible to students throughout the district.

