Perris Union High School District
Course of Study

A. COURSE INFORMATION

Course Title:
PLTW Principles of Biomedical Science
- ☐ New
- ☒ Revised

If revised previous course name if changed
N/A

Transcript Course Code/Number:
(To be assigned by Educational Services)

Subject Area:
- ☐ Social Science
- ☐ English
- ☐ Mathematics
- ✔ Laboratory Science
- ☐ World Languages
- ☐ Visual or Performing Arts
- ☐ College Prep Elective
- ☐ Other

Is this classified as a Career Technical Education course?
- ☐ Yes
- ✔ No

Grade Level
- ☐ MS
- ☐ HS
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ✔ 9
- ✔ 10
- ✔ 11
- ✔ 12

Required for Graduation:
- ☐ Yes
- ✔ No

Meets UC/CSU Requirements?
- ✔ Yes
- ☐ No

Was this course *previously approved by UC* for PUHSD?
- ✔ Yes
- ☐ No

(Will be verified by Ed Services)

Credential Required to teach this course:
Single Subject Science: Biological Science

To be completed by Human Resources only.

Signature: [signature] Date: 6-2-21

Meets "Honors" Requirements?
- ☐ Yes
- ✔ No

Meets "AP" Requirements?
- ☐ Yes
- ✔ No

Submitted by: Jennifer West
Site: PVHS Science
Date: 5/21/21

Unit Value/Length of Course:
- ☐ 0.5 (half year or semester equivalent)
- ✔ 1.0 (one year equivalent)
- ☐ 2.0 (two year equivalent)
- ☐ Other:

Approvals	Name/Signature	Date
Director of Curriculum & Instruction	[signature]	6/4/21
Asst. Superintendent of Educational Services	[signature]	6/7/21
Governing Board		

Prerequisite(s) (REQUIRED):

Required (prerequisite OR corequisite):

Biology or AP Biology

Corequisite(s) (REQUIRED):

See above

Brief Course Description (REQUIRED):

Principles of Biomedical Science (PBS) is a full-year high school course in the PLTW Biomedical Science Program. This course serves to provide foundational knowledge and skills in fields such as biology, anatomy & physiology, genetics, microbiology, and epidemiology as well as engage students in how this content can be applied to real-world situations, cases, and problems. Through both individual and collaborative team activities, projects, and problems, students will tackle real-world challenges faced by biomedical professionals in the field. They will work with the same tools and equipment used in hospitals and labs as they engage in relevant hands-on work. Students will develop skill in technical documentation to represent and communicate experimental findings and solutions to problems. In addition, students will explore how connections to other disciplines such as computer science and engineering shape the future of medicine and practice collaboration techniques that will help them connect with professionals across any field.

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: Medical Investigation

In Unit 1 students engage in forensic science and medical examination investigations in order to: a.) explore biological and forensic science careers; b.) gain experience in experimental design and data analysis; c.) learn about biomolecules and their role in determining identity; d.) learn about human anatomy and physiology and causes of death; e.) practice synthesizing multiple forms of data to draw conclusions; and f.) work to develop professional communication skills.

Unit 1 Lessons

- Lesson 1.1 Investigating the Scene

- Lesson 1.2 Master the Morgue
- Lesson 1.3 Open Investigation

Unit 2: Clinical Care

Students assume the role of different medical professionals working through the schedule of patients in a family care clinic in order to: a.) explore medical careers; b.) practice professional communication; c.) gain experience collecting, recording, and interpreting physiological data; d.) learn how to perform routine medical tests and evaluate results; e.) learn about cutting edge technologies revolutionizing healthcare; f.) understand the interconnectedness between body systems; and g.) explore the various causations and inheritance of disease.

Unit 2 Lessons

- Lesson 2.1 Talk to Your Doc
- Lesson 2.2 Decoding a Diagnosis
- Lesson 2.3 New to the Practice

Unit 3: Outbreaks & Emergencies

Working as public health officials and then as emergency responders, students are presented with a series of events they must address while exploring: a.) careers in public health, epidemiology, microbiology and emergency medicine; b.) professional communication and presentation; c.) data analysis; d.) processes by which critical medical decisions are made and acted upon; e.) processes by which patients are diagnosed with a contagious disease and by which a causative agent is identified.

Unit 3 Lessons

- Lesson 3.1 Nosocomial Nightmare
- Lesson 3.2 Emergency Response
- Lesson 3.3 Information Sharing

Unit 4: Innovation, Inc.

Welcome to PLTW Innovation, Inc. – an incubator for innovation where some of the best minds in science and engineering endeavor to solve some of the world's most pressing biomedical challenges. Students tour Innovation, Inc. labs and engage in experiences designed to: a.) build their engineering and experimental design process skills, b.) challenge them to design solutions to current and emerging issues both on and off this world, c.) tangibly highlight that solutions to biomedical science problems rely on collaboration between professions, d.) build their computer science skills by using computer aided design (CAD) and geographic information system (GIS) to innovate the future of medicine, and e.) explore career fields on the forefront of medicine.

Unit 4 Lessons

- Lesson 4.1 Designing the Future
- Lesson 4.2 New Frontier
- Lesson 4.3 Invitation to Innovation

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: Medical Investigation

Lesson 1.1 - Investigating the Scene

- What are different forms of evidence, how infallible are they, and how are they useful in resolving potential criminal cases?
- How can varying forms of evidence be evaluated for meaning?
- How does technology help bring resolution to forensic cases? Or how does technology advance understanding in forensic science?

Lesson 1.2 - Master the Morgue

- How can the cause, mechanism, and manner of death be established?
- What information can be collected from an autopsy?
- How can information collected during an autopsy lead to an understanding of disease and/or cause of death?
- In what ways are the careful evaluation of evidence and accurate recording of data critical to establishing legitimate testimony?

Lesson 1.3 - Open Investigation

- How can individual pieces of evidence, evaluated against the whole, be used to resolve questions?
- In what ways can scientific writings and presentations be utilized to present evidence and justify
- conclusions?
- To what extent can current understandings be reinforced through practice?

Unit 2: Clinical Care

Lesson 2.1 - Talk to Your Doc

- How can an individual's health status be assessed and evaluated?
- What factors make an individual more susceptible to disease?
- What are strategies for maintaining health?
- What are effective means of communicating with others in order to reach common goals?
- What qualities make for an effective medical professional?
- In what ways, and for what purpose, can patient confidentiality be maintained?

Lesson 2.2 - Decoding a Diagnosis

- How can changes in a genome lead to disease?
- Why is an understanding of heredity an important factor in human health?
- In what ways are genetic changes acquired?
- In what ways can altered biological processes lead to disease?
- How can the genetic health of an individual be evaluated?

Lesson 2.3 - New to the Practice

- N/A

Unit 3: Outbreaks & Emergencies

Lesson 3.1 - Nosocomial Nightmare

- In what ways, and for what purpose, can microorganisms be characterized?
- What factors affect the growth and death of microorganisms?
- What are effective strategies for preventing and treating disease?
- How does an immune system identify and eradicate infection?
- How can pieces of evidence be evaluated to form conclusions and inform decisions?

Lesson 3.2 - Emergency Response

- How can an individual's health status be assessed and evaluated?
- How is patient case information summarized and communicated efficiently?
- What professions respond in emergency situations, what are their roles, and how do they work together?
- What are several career paths in the field of emergency medicine?
- How do patient vitals and presumptive diagnoses inform the prioritization for treatment options in emergency medical situations?
- What makes for effective emergency and disaster response protocols?
- How do medical professionals manage emergencies that involve multiple patients?
- To respond to emergency situations, what common medical resources and facilities need to be available?

Lesson 3.3 - Information Sharing

- What are features of a user-friendly app?
- In what ways can technology enable a faster response and quicker resolution during medical emergencies?

Unit 4: Innovation, Inc.

Lesson 4.1 - Designing the Future

- How do the engineering and experimental design processes enable innovation?
- Who innovates, and why?
- What is the process for innovation and what personal characteristics are required for success?
- How do innovations impact and advance human health?

Lesson 4.2 - New Frontier

- How does technology function as a vehicle for innovation?
- In what ways do different types of scientists and engineers collaborate in the biomedical sciences field?
- What are potential untapped resources that could work to advance the field of biomedical sciences?

Lesson 4.3 - Invitation to Innovation

- 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. • Students will maintain a 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.*	
Numerous online resources as specified by PLTW curriculum (varies by lesson).	
Estimated costs for classroom materials and supplies (REQUIRED). *Please describe in detail.* If more space is needed than what is provided, please attach backup as applicable.	
Cost for class set of textbooks: $	Description of Additional Costs:
Additional costs: $4862 per 36 students	PLTW Inventory List for a Pre-Existing Principles of Biomedical Science Course (2021)
Total cost per class set of instructional materials:	$4862

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 End-of-Course Exam (created and administered by PLTW)

COURSE PACING GUIDE AND OBJECTIVES (REQUIRED)				
Day(s)	**Objective**	**Standard(s)**	**Chapter(s)**	**Reference**
21	Lesson 1.1 - Investigating the Scene	N/A	N/A	N/A
16	Lesson 1.2 - Master the Morgue	N/A	N/A	N/A
4	Lesson 1.3 - Open Investigation	N/A	N/A	N/A
17	Lesson 2.1 - Talk to Your Doc	N/A	N/A	N/A
22	Lesson 2.2 - Decoding a Diagnosis	N/A	N/A	N/A
4	Lesson 2.3 - New to the Practice	N/A	N/A	N/A
18	Lesson 3.1 - Nosocomial Nightmare	N/A	N/A	N/A
18	Lesson 3.2 - Emergency Response	N/A	N/A	N/A
6	Lesson 3.3 - Information Sharing	N/A	N/A	N/A
17	Lesson 4.1 - Designing the Future	N/A	N/A	N/A
12	Lesson 4.2 - New Frontier	N/A	N/A	N/A
6	Lesson 4.3 - Invitation to Innovation	N/A	N/A	N/A

C. HONORS COURSES ONLY
Indicate how much this honors course is different from the standard course.
N/A

D. BACKGROUND INFORMATION
Context for course (optional)
The following outlines the skills and content knowledge students are expected to obtain in the Principles of Biomedical Science 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 PBS students can make within a workplace.

Laboratory Skills

- Aseptic technique
- Bacterial culturing, plating, and identification (Gram staining)
- Blood testing and typing
- Dissection
- DNA extraction
- DNA gel electrophoresis
- Fingerprint and hair analysis
- Karyotyping
- Applied math
- Micropipetting
- Microscopy
- Standard curve creation and utilization

Clinical Skills

- Bloodwork analysis
- Blood drawing
- Blood pressure measurement and analysis
- Clinical empathy
- Heart rate measurement and analysis
- HIPAA legislation and implications understanding
- Scientific terminology and abbreviation usage
- Patient questioning, record keeping and documentation
- Pedigree construction and analysis
- Controlled bleeding techniques
- Triage

Equipment and Software Proficiencies

- ArcGIS
- TinkerCAD
- Productivity software (Google Docs, Sheets, Slides)
- Probes and sensors (temperature, respiration, heart rate)
- Data acquisition software (Graphical Analysis)
- Light microscope
- Gel electrophoresis
- Micropipettes
- Electronic balance

Scientific Experimentation Skills

- Design and conduct reliable scientific experiments
- Analyze and interpret laboratory data
- Construct graphs (by hand and using graphing software)
- Interpolate and extrapolate data from a graph
- Draw conclusions based on experimental data
- Thoroughly and clearly communicate results and conclusions both orally and in writing

Design Process Experience

- Solve a problem using an iterative design process
- Work collaboratively on a design team to design a product or solve a problem
- Document in detail the design process used to solve a problem or design a product
- Develop a detailed and comprehensive design brief
- Brainstorm to generate creative ideas and potential solutions to a problem
- Carry out a plan to compare alternate solutions and select the best solution path
- Evaluate a design solution with respect to design criteria and constraints

Professional Skills

- Team collaboration
- Peer review and feedback
- Project management
- Problem-solving
- Oral communication and presentation
- Technical writing
- Ethical reasoning

Course Knowledge

- Bioethics
- Biomedical science careers
- Body systems (selected) anatomy and physiology
- Cancer biology
- Cell biology
- Crime scene investigation
- Disease treatment and prevention
- Drug design
- Emergency medicine and medical surge
- Forensic investigation, manner, mechanism and cause of death
- High throughput screening (HTS)
- Homeostasis and positive and negative feedback mechanisms
- Infectious disease transmission
- Inheritance
- Interrelationship between body systems, health, and disease
- Mitosis and meiosis
- Molecular biology
- Pathology of disease: infectious, hereditary, and physiological diseases
- Protein synthesis
- Punnett squares
- Relationship between DNA, mutations, protein structure, and disease or dysfunction
- Relationship between genes, chromosomes, and DNA
- Restriction fragment length polymorphisms (RFLP) analysis
- Structure of DNA

Engagement Experiences

- Laboratory investigations
- Case studies
- Instant challenges
- Simulations
- Role playing
- Digital design: podcasts, videos, etc.
- Thought experiments
- Design thinking

History of Course Development (optional)

The purpose of this revision is to update the content of the Principles of Biomedical Science (PBS) course to reflect the 2020-21 curriculum update by Project Lead the Way. This revision also establishes the required prerequisite/ corequisite or Biology or AP Biology that was not present when the course was initially written in 2013.