Perris Union High School District
Course of Study

A. COURSE INFORMATION

Course Title:
Advanced Biology
- ☐ New
- ☑ ~~Revised~~

If revised previous course name if changed

Transcript Course Code/Number:
Old Course No. 436A & 436B
(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: ~~Biological Science~~ Biological Sciences

To be completed by Human Resources only.

Signature 2-16-22 Date

CalPADS CODE

Meets "Honors" Requirements?
- ☐ Yes
- ☑ ~~No~~

Meets "AP" Requirements?
- Yes
- ☑ ~~No~~

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

Submitted by: Heaven Boone
Site: PVHS
Date: 2/4/2022

Approvals	Name/Signature	Date
Director of Curriculum & Instruction		2/14/22
Asst. Superintendent of Educational Services		2/14/22
Governing Board		

Prerequisite(s) (REQUIRED):

None

Corequisite(s) (REQUIRED):

None

Brief Course Description (REQUIRED):

Advanced Biology emphasizes all aspects of the state content standards primarily through lecture and class discussions. Most topics are supplemented with laboratory activities, discussions regarding current advancements/events in biology, class projects and research activities.

The course integrates earth science into standard biology concepts from a phenomenon-based approach. It is aimed at building a solid foundation in biology, integrating an intensive laboratory component that consists of both classroom labs and practical field studies, and building student competency in science practices and crosscutting concepts. Students will apply their knowledge of Disciplinary Core Ideas to various real-world phenomena. Earth and space science concepts will be incorporated at logical points in the curriculum to enhance student learning. Students will view these phenomena through the lenses of the crosscutting concepts, such as Energy and Matter (ecology, biochemistry), Inheritance and Variation of Traits, or Structure and Function (cells and mitosis and cancer). Students will demonstrate their knowledge in use through their engagement in the Science and Engineering Practices during hands-on activities and labs.

As compared to the introductory biology class, topics are covered in much more depth in the advanced course. The advanced course also moves at a faster pace and features regular written exams and an extensive final research project. The class also features increased use of lab, computer technology and engineering practices. Mathematics is also integrated into lab investigations where appropriate. This course may be taken in lieu of the introductory biology course for students with an interest in the sciences and/or healthcare field and plan to take honors and advanced placement science courses.

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.

The purpose of this course is to prepare students for college-level coursework in biological sciences and for careers in health science or medicine. Upon successful completion of this course, students will be able to do the following:

1. Illustrate and explain the structures and processes from molecules to organisms.

2. Analyze the interactions, energy and dynamics of ecosystems.
3. Predict the inheritance and variation of traits in heredity.
4. Evaluate unity and diversity in biological evolution.
5. Explain earth's place in the universe and identify earth's systems.
6. Analyze human activity towards the earth.
7. Create an engineering design.

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.

Advanced Biology offers the student that has an interest in the healthcare field the opportunity to learn about biology concepts at a higher level than the introductory class.

It prepares the student for collegiate level coursework in the biological and health sciences and introduces the student to career opportunities in the health sciences.

The course content is aligned to the high school life science section of the Next Generation Science Standards, particularly topics 1) Structure and Function and 2) Inheritance and Variation of Traits, and 3) Matter and Energy in Organisms and Ecosystems. The ideas presented will build upon students' science understanding of disciplinary core ideas, science and engineering practices, and crosscutting concepts from earlier grades.

Unit 0 - Science Skills and Engineering Practices

This brief introductory unit is designed to build upon foundational skills in scientific inquiry and strengthen mathematical skills needed to analyze data, spreadsheet and word-processing skills to present data, and refine their understanding of engineering principles needed to develop a solution to a problem within given constraints. These skills will be called up and further developed throughout the course. Topics of study and coursework will include engaging in arguments from evidence, systems and system models, accuracy and precision, types of data, mathematical manipulation, recording of results, analyzing raw data, constructing tables, drawing graphs, describing statistics and the spread of data, and engineering principles.

Unit 1: Ecosystem Interactions & Energy

Students use mathematical and computer models to determine the factors that affect the size and diversity of populations in ecosystems, including the availability of resources and interactions between organisms. Taking a systems-based approach to ecosystems, students develop models of the cycling of matter and flow of energy within an ecosystem. The focus is on the interactions between both biotic and abiotic conditions. The Anchoring Phenomenon for the unit is: Should Mountain lion populations be culled in order to stabilize the endangered Big Horn Sheep populations in CA?

Unit 2: History of the Earth, Photosynthesis, Respiration and Climate Change

Students use modeling, inquiry and experimentation to learn about earth's history, photosynthesis and cellular respiration. As the unit progresses, students will be addressing how these factors and human activities have affected Earth's climate. The focus of this unit is to contextually analyze how earth's processes and climate are affected by both biotic and abiotic factors. The Anchoring Phenomenon for this unit is: Self Sustaining Biosphere (Concepts and projects will come back to observations on the Ecosphere jars). Throughout this unit, students will relate the topics learned to their aquatic and terrestrial ecospheres.

Unit 3: Evolution, Ecosystem Stability and Climate Change

Students focus on the effect of climate change on pika populations (anchoring phenomenon) as they work through the concepts of Natural Selection, Evolution and Evidence for Evolution. Students will observe the effects of climate change on oceans through an inquiry activity. Students will study the effects of natural and human induced changes on ecosystems and the populations within them. They will use computer models to investigate how Earth's systems respond to changes, including climate change. Students will learn about geologic events that affected the fossil record and they will analyze the effects of the environment on Natural Selection. Modeling is a focus for this unit. The Illinois Storyline on Antibiotics and Evolution may be used for this unit (http://www.nextgenstorylines.org/why-dont-antibiotics-work-like-they-used-to). This unit culminates with a group research project. Students are given the choice of ecological problems caused by humans. They research and present their findings, including a solution to the class.

Unit 4: Inheritance of Traits

Students develop explanations about the specific mechanisms that enable parents to pass traits on to their offspring. They make claims about which processes (meiosis, viable errors occurring during replication, and/or mutations caused by environmental factors) give rise to variation in deoxyribonucleic acid (DNA) codes and calculate the probability that offspring will inherit traits from their parents. Students analyze data to investigate the relationship between a trait's occurrence within a population and environmental factors. The anchoring phenomenon for this unit is Epigenetic Change.

Unit 5: Structure, Function, and Growth of Cells

Students use models to create explanations of how cells use DNA to construct proteins, build biomass, reproduce, and create complex multicellular organisms. Students finally zoom down to the microscopic mechanisms with a focus on DNA's role in cellular operations. They investigate how organisms maintain stability necessary for survival. Students extend their knowledge of cells and body systems by examining several processes on the molecular scale.

Unit 6: Homeostasis, Structure, Function and Growth of Body Systems

Students will study the major human body systems. The focus of this unit is maintaining homeostasis. The phenomenon for the unit is how nutrition affects the body systems. Students will learn through modeling, direct instruction, inquiry, and computer simulations. This unit culminates with a project that has the students analyze how the human body systems would respond to being attacked by a shark. Students are given a scenario and are asked to make predictions and provide justification for how the body systems respond to being attacked by a shark. Nutrition is a component of the shark attack project.

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

From Unit 4:
"You are not the Mother of your Children": In this Buffalo Case Study, students analyze a court case where a mother was accused of kidnapping her own children. The students learn about chimeras and epigenetic inheritance as they proceed through the case study.

Students will write a response to the following questions:
Using your knowledge of the normal process of gametogenesis and fertilization, formulate a hypothesis as to how a chimeric individual could form. In addition to paternity testing, DNA testing is now used legally in many civil and criminal cases. In what kinds of cases other than parentage could the presence of chimerism cause problems? Propose a situation in which DNA testing of a chimeric individual might lead to an unjust legal decision. Does this case raise any other questions

for you? The questions do not have to be biological or legal in nature.

From Unit 5:
The Case of the Dividing Cell: Students follow the instructions through a Buffalo Case Study. The study reviews the process of oogenesis, spermatogenesis, mitosis and meiosis. Students use their knowledge of these processes to solve a "crime" that took place within a cell.

Students will write a response to the following questions:
Explain the stages of meiosis in eukaryotic cells. Realize that there are two cell divisions involved, each having their particular terms and characteristics. Explain the key differences between mitosis and meiosis. Do prokaryotes have mitosis or meiosis? Crossover occurs between homologous pairs of chromosomes, but can it occur between two different chromosomes, say between #1 and #17? Was it an evolutionary necessity that meiosis evolved at the same time as sexual reproduction?

From Unit 6:
Atkins or Fadkins Case Study: In this Buffalo Case Study, students read about a discussion that high school students are having regarding the Adkins diet and its health benefits and risks. The study not only teaches students about nutrition and the effect on the major body systems, it also brings in moral and ethical situations by focusing on eating disorders.

Students will create a summary essay:
Now that you've explored some answers to questions that came up during your conversations with Janine and Mitchell, give Mitchell the advice you think he needs. Throughout this case you've been exploring homeostasis in weight change and hormone systems, so be sure you thoroughly discuss homeostasis of these systems in your response. Janine had concerns about Mitchell's body image, so discuss body image and factors affecting both actual weight and perceived body size in your response. Include the information that you've collected about: proteins, carbs, and fats; obesity and body image; hormonal control of blood sugar levels, water balance, and appetite; possible effects of low-carb diets on the brain and the kidneys; a definition of metabolism and what controls it. Finally, state your advice about what Mitchell should do, if anything, about his diet.

INSTRUCTIONAL MATERIALS (REQUIRED)	
Textbook #1	
Title: Biology	Edition: N/A
Author: Nowicki, Stephen	ISBN: ISBN-13: 978-0-618-72510-6
Publisher: McDougal Littell	Publication Date: 2008
Usage: • ~~Primary Text~~ ❑ Read in entirety or near	
Textbook #2	
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.*

- BioDigital Human (3D anatomy): https://human.biodigital.com/login?returnUrl=/explore
- Anatomical Science Image Library: https://www.anatomy.org/AAA/Resources/Anatomical-Science-Image-Library
- PubMed Central (biomedical & life science journal articles): https://www.ncbi.nlm.nih.gov/pmc/about/intro/
- National Center for Case Study Teaching in Science: https://sciencecases.lib.buffalo.edu/collection/
- CK12 Flexbooks https://www.ck12.org/student/

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: $3,888	Description of Additional Costs:
Additional costs: $0	
Total cost per class set of instructional materials:	$3,888 Note - Textbooks were purchased for the original Biology Course. No further expenditures are necessary for the current school site (PVHS).

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

Key Assignment Examples:

- Interactive notebook - includes diagrams, notes from the textbook and from lecture, graphic organizers, articles to annotate, lab handouts, and misc. reference materials.
- Labs – DNA Extraction, Sugar Lab, Ocean Acidification Lab
- Modeling activities – meiosis & mitosis, DNA replication, transcription & translation, erosion prevention
- Small Group Oral Quizzes - formative, during labs and activities
- Case Studies - in-depth analysis of processes
- Study Sets - daily practice quizzes (single topic or mixed)
- Practice by Topic Sets - optional single topic practice quizzes
- Test Review Sets - mixed topic practice quizzes
- Unit Tests - randomized T/F, MC, fill-in, mixed topic, 1 per unit

- Free Response Tests - short answer/essay, 1 per unit
- Semester Finals - comprehensive exams, 1 per semester
- Culminating project - extensive research project and professional presentation

Specific Unit Key Assignment Examples:

Unit 0-

- Living vs Nonliving: Students will observe and make predictions about various materials to determine if they are living or non-living. Students will compare and discuss their conclusions with classmates.
- Woodn't it be Nice: Students will create a graph of tree ring diameters of two different trees. Students will then make predictions about the tree's climate history based on the size of the tree rings.

Unit 1-

- Age Structure Activity: Using the census.gov website, students will observe the age structure of various populations around the world. Students will then discuss the economic, ecological and social impact of human population sizes on the ecosystem.
- Ecosystems and Biodiversity Simulation: Students use a computer simulation (*goo.gl/85zi37)* to analyze the relationship between food web complexity and biodiversity. Students are asked to consider how each crosscutting concept applies to the simulation.
- Written Exam- Explain the economic, ecological, and social impact of human population sizes on the ecosystems.

Unit 2-

- Students will work in cooperative groups to learn and predict information about photosynthesis and respirations. Students are assigned roles in their groups.
- Oxygen as a Superweapon: Students will watch a Video "Oxygen as a Superweapon" and create a claim, evidence, reasoning chart to predict how the release of oxygen in the atmosphere affects life on Earth.
- Written Exam- Explain how photosynthesis and cellular respiration contributes to the amount of oxygen in the atmosphere and how this affects life on Earth.

Unit 3-

- Pika Information and Activities: Students will learn about the plight of the pika through climate and geographic data. Students will directly interact with the crosscutting concepts. They will analyze data and compare their information with their peers. They will then make modifications to their models. Students will refer back to the pika during the unit when prompted by their instructor.
- Cladogram Activities: Students will be given various materials with which to create cladograms. They will use a Bozeman video and cut out pieces to create a cladogram, then students will create a more complex cladogram using "paper fossils." Students will be given the opportunity to compare and adjust their cladograms as they discuss their results with their peers.
- Written Exam- Explain the effects of natural and human induced changes on ecosystems and the populations within them.

Unit 4-

- Epigenetics of Twins: Students are creating a model of identical twins and how they phenotypically diverge over their lifetimes based on the choices they make throughout their lives. Students then share their results with the class and discuss the way in which the environment affects their genes.
- Punnett Square Practice: Students learn Punnett squares through direct instruction. Students will then practice Punnett squares and mathematically analyze the results of the different inheritance patterns.
- Written Exam- Explain how a trait's occurrence within a population may be influenced by environmental factors.

Unit 5-

- Cell City: Students create a model of a city by using analogies from parts of the cell. Students are required to justify their analogy choices and present their models to the class.
- Mitosis Models: Students use chalk markers (or pipe cleaners on poster paper) to model the process of mitosis. Students then rotate to the next lab station and label another group's model of mitosis. Finally, students rotate to a 3rd lab station and write a summary of the process of mitosis.
- Written Exam- Describe the process of how our DNA is used to create complex multicellular organisms like us.

Unit 6-

- HHMI Vertebrate Circulatorium (coupled with "The Sweet Danger of Sugar"): Students work through a computer simulation of the cardiovascular systems of vertebrate animals. This is a comparative anatomy computer simulation in the "click and learn" style of instruction. The assignment ends with students reading an article titled, "The Sweet Danger of Sugar" and answering questions regarding the effects of sugar on the human circulatory system.
- Written Exam- Explain how nutrition affects the body systems and its role in maintaining homeostasis.

Instructional Methods and/or Strategies (REQUIRED):

Please list specific instructional methods that will be used.

- Direct instruction
- Inquiry learning
- Interactive notebooking
- Cooperative learning (small groups)
- Note-taking
- Consensus building
- Close reading
- Whiteboarding
- Marking the text
- Jigsaw activities
- Graphic organizers
- Station rotation activities
- Nonlinguistic representations
- Modeling activities
- One-pagers
- Philosophical chairs
- Sorting/Classifying
- Daily reinforcement of factual knowledge through retrieval practice, spaced repetition, interleaving, and corrective feedback
- Comparing/Contrasting
- Summarizing

Assessment Methods and/or Tools (REQUIRED):

Please list different methods of assessments that will be used.

- Creative assignments (Canva)
- Instructional video production (Canvas Studio, FlipGrid, etc.)
- Student presentations (Google Slides)
- Traditional online tests and quizzes (Canvas)
- Oral assessments (small group)
- Written free response tests

COURSE PACING GUIDE AND OBJECTIVES (REQUIRED)				
Day(s)	**Objective**	**Standard(s)**	**Chapter(s)**	**Reference**
10	Unit 0 - Science Skills and Engineering Practices	HS-ETS1-1. HS-ETS1-2. HS-ETS1-3. HS-ETS1-4.	N/A	N/A
20	Unit 1: Ecosystem Interactions & Energy	HS-LS2-1. HS-LS2-2. HS-LS2-3. HS-LS2-4. HS-LS2-6. HS-LS2-8.	Ch. 13 & 14	Pg. 394-453
24	Unit 2: History of the Earth, Photosynthesis, Respiration and Climate Change	HS-LS1-5. HS-LS1-6. HS-LS1-7. HS-LS2-5.	Ch. 4 & 12	Pg. 98-131 & 368-375
28	Unit 3: Evolution, Ecosystem Stability and Climate Change	HS-LS2-6. HS-LS2-7. HS-LS2-8. HS-LS4-1. HS-LS4-6.	Ch.12, 14, 15, 16	Pg. 358-367 & 426-511
1	Semester 1 Comprehensive Final	N/A	N/A	N/A
35	Unit 4: Inheritance of Traits	HS-LS1-4. HS-LS3-1. HS-LS3-2. HS-LS3-3.	Ch. 6 & 7	Pg. 166-223
30	Unit 5: Structure, Function, and Growth of Cells	HS-LS1-1. HS-LS4-2. HS-LS4-3. HS-LS4-4.	Ch. 8, 11	Pg. 224-261 & 326-357

		HS-LS4-5.		
24	Unit 6: Homeostasis, Structure, Function and Growth of Body Systems	HS-LS1-2. HS-LS1-3.	Ch. 28	Pg. 850-871
4	Culminating Project	N/A	N/A	N/A

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

D. BACKGROUND INFORMATION
Context for course (optional)
History of Course Development (optional)