EL DORADO UNION HIGH SCHOOL DISTRICT
EDUCATIONAL SERVICES

Course of Study Information Page

COURSE TITLE
Environmental Botany

DISTRICT COURSE NUMBER	4-DIGIT STATE COURSE CODE (COMPLETED BY SILT)
#0332	**2605**

Rationale:

We rely on the natural bounties that the Earth provides for our sustenance, recreation, building materials, employment, and energy. Plants, as primary producers, constitute the foundation of Earth's ecosystem. Our increasingly complex relationship with these ecosystems requires that our students have a thorough understanding of our interactions with the environment. This understanding will lead them to become good stewards for future generations. This course fulfills a graduation requirement and a requirement for university admission. It also provides a bridge between Biology and Chemistry, a transition many students find difficult. Additionally, this course takes advantage of the El Dorado High School East Campus, a facility with numerous teaching resources including laboratory rooms, a greenhouse, native plants, and both new and established cultivated plants. Environmental Botany, as a course, will allow more students from a greater variety of academic backgrounds to access these resources.

Course Description that will be in the Course Directory:

This upper division science course is offered to students with a desire to learn about the ecologic and economic functions of plant cultivation with respect to common horticultural and native plants. They will study and know how to identify, grow, harvest and care for commonly grown species of plants. Students will learn about the biological role of plants and the human impacts on, and care of plants within an ecosystem. Moreover, they will gain knowledge of nursery and greenhouse management that will ultimately prepare the student to gain employment, study plant conservation, or tend to and care for their own garden.

How Does this Course align with or meet State and District content standards?

This course meets NGSS standards and CTE standards in the Forestry and Natural Resources Pathway and Plant and Soil Science Pathways.

NCLB Core Subjects:

Select up to two that apply:

☐ Arts	☐ Civics and Government	☐ Not Core Subject
☐ Economics	☐ History	
☐ English	☐ Mathematics	
☐ Foreign Language	☐ Reading / Language Arts	
☐ Geography	☒ Science	

CDE CALPADS Course Descriptors:

(See Page 2 for Definitions)

CTE TECH PREP COURSE INDICATORS	CTE COURSE CONTENT CODE	INSTRUCTIONAL LEVEL CODE
☐ Tech Prep (32) (Higher Ed)	☒ CTE Introductory (01)	☐ Remedial (35)
☐ Tech Prep & ROP(33) (Higher Ed)	☐ CTE Concentrator (02)	☐ Honors UC-Certified (39)
☐ ROP (30)	☐ CTE Completer (03)	☐ Honors Non UC-Certified (34)
☒ N/A	☐ Voc Subject _____	☐ College (40)
	☐ N/A	☒ N/A

Length of Course: ☒ Year ☐ Semester

Grade Level(s): ☐ 9 ☒ 10 ☒ 11 ☒ 12

Credit:

☒ Number of credits: **10**
☒ Meets graduation requirements (subject **life science**)
☒ Request for UC "a–g" requirements
CSU/UC requirement **d**

☒ College Prep

Prerequisites:	Biology, with a passing grade of C- or better.
Department(s):	Natural Resources
District Sites:	EDHS
Board of Trustees COS Adoption Date:	~~June 9, 2015~~ January 26, 2016 (Name change, content added)
Textbooks / Instructional Materials:	**Horticulture: Principles & Practices**, George Acquaah, 2009-4th Edition, Pearson Pub., ISBN: 978-0-13-159247-6
Funding Source:	General fund
Board of Trustees Textbook Adoption Date:	June 9, 2015

Definitions

CALPADS	California Longitudinal Pupil Achievement Data System
CTE Technical Prep	A course within a CTE technical career pathway or program that has been articulated with a postsecondary education or through an apprenticeship program of at least 2 years following secondary instruction.
Instructional Level Code	Represents a nonstandard instructional level at which the content of a specific course is either above or below a 'standard' course instructional level. These levels may be identified by the actual level of instruction or identified by equating the course content and level of instruction with a state or nationally recognized advanced course of study, such as IB or AP.
Instructional Level Honors, UC Certified	Includes all AP courses.
Instructional Level Honors, non UC Certified	Requires Board approval.
Instructional Level College	Includes ACE courses. Equivalent to college course and content, but not an AP course. Not related to section, but to course.

EL DORADO UNION HIGH SCHOOL DISTRICT

EDUCATIONAL SERVICES

Course Title: Environmental Botany (#0332)

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EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Environmental Botany** Course Number: **(#0332)**

Unit Title: **Plant Biomes**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E3.1—Demonstrate techniques used to classify soils.
E3.3—Analyze soils found in the different natural resource management areas.
E5.2—List habitat requirements for different species and identify factors that influence population dynamics.
E6.1—Summarize the different types of aquatic resources.
E6.4—Analyze the relationship between water quality and aquatic species habitat.
E8.3—Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
G9.1—Identify and classify the plants and animals in an agricultural system (as producers, consumers, or decomposers).
G10.1—Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

During this unit, students will become familiar with the distribution and location of certain groups of plants based on global distribution of sunlight (temperature) and precipitation (rainfall) for terrestrial plants, and salinity and depth with respect to aquatic plants.

Goals:
- Understand that temperature and precipitation are the main criteria that determine where a terrestrial plant will grow.
- Understand that salinity and depth are the main criteria that determine where an aquatic plant will grow.
- Analyze different biomes around the world and give reasons why the types of plants have similar attributes in similar climates.
- Evaluate the likely success of a plant in a region based on the climate and conditions of said region.
- Know why certain biomes (tropical forest, desert, tundra, etc.) are found in specific patterns around the globe.

Objectives:
- Compare and contrast the primary needs of terrestrial and aquatic plants.
- Determine the type/texture of specific soil samples.
- Identify and explain several limiting factors for both terrestrial and aquatic plants.
- Compare and contrast the types of plants found in unique biomes.
- Explain how moving up in latitude is similar to moving up in elevation for plant types.
- Discuss how elevation and latitude affect the distribution of plants.
- Describe the rainshadow effect.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Common Core State Standards.

Teacher will use direct instruction with multimedia presentations, along with Socratic questioning, to relate students' personal experiences with the specific topics they will be studying in the week(s) ahead

The primary driving method in this course is inquiry, wherein students will be challenged with a situation and tasked with analyzing and interpreting their findings/data/research and applying what they have learned to both local and global real life examples. During laboratory activities and investigations, students will work in cooperative groups incorporating both small and large group discussion, as well as cooperative learning.

Finally, student will be expected to synthesize and communicate data and information in the form of scientific writing, graphic organizers, and formal presentations.

The progression of units in this course necessitates that students draw connections between the units and the investigations they have performed. This naturally builds in circular review, which strengthens the depth of knowledge students acquire.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Chapter Assignments—These formative assignments help to build the students foundation for the information they will learn during the unit. Weekly assignments serve to assess and give immediate feedback to the students as to how they are progress in the acquisition of the content knowledge. These assignments inform the instructor as to the progress of the students and allow the instruction of the material to be adjusted, should students need remediation or if they require supplementary instruction.

Projects and Labs—these are the primary foundation for this program and indicate how well a student applies the information covered in the text and lecture with the processes and skills necessary for proper field research. As this is a science based class, it is imperative that students demonstrate application of their knowledge through inquiry and observation. Semester-long projects will incorporate the use of a detailed rubric. Students will receive a copy of the rubric prior to beginning each project, and it will be used in self- and peer-evaluations.

Specific labs during this unit include:

- Plant Anatomy Identification
- Density of Stomata

Quizzes—These short assignments are used as formative assessment to help the instructor understand whether or not the material covered in class is understood by the students. These are primarily used to assess what is understood by a majority of the students and what areas are in need of emphasis or reteaching.

Tests—These longer assessments are the summative portion of the units and will determine whether or not the over-reaching goals of the units are understood by the students. The information will also help the teacher to redesign learning objectives for the following year and make adjustments to curriculum.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Formative assessments, such as chapter review questions and quizzes, will be followed by immediate reteaching through large group discussion and peer tutoring.

Many labs will be conducted over the course of several class periods. At the end of each class period, the teacher will scan the parts students have completed to that point, and clarify or correct misconceptions at the opening of the following period.

Semester-long projects will include multiple checkpoints so that the teacher can track students' progress and correct misconceptions. These checkpoints will involve peer evaluation and small-group meetings with the teacher to correct errors and address any challenges that may arise.

Students who miss entire assignments will have the opportunity to make up work by making appointments with the teacher, during which they can receive one-on-one or small group tutoring.

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Environmental Botany** Course Number: **(#0332)**

Unit Title: **Plant Physiology**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E8.3—Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
E8.4—Recognize and explain the factors that influence plant growth, such as respiration, temperature, nutrients, and photosynthesis.
G1.3—Demonstrate how common plant parts are used to classify the plants.
G2.2—Test plant cellular function reactions when plants are grown under different conditions.
G2.3—Explain functions organelles play in the health of the cell.
G2.4—Recognize the part of the cell that is responsible for the genetic information that controls plant growth and development.
G2.6—List which organelles in plant cells carry out photosynthesis.
G3.1—Investigate plant systems, nutrient transportation, and energy storage.
G3.2—Label the seed's essential parts and describe their functions.
G3.5—Identify the tissues seen in a cross section of woody and herbaceous plants.
G4.1—Explain the different forms of sexual and asexual plant reproduction.
G10.1—Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.

Source: Next Generation Science Standards
LS1.A—Structure and Function

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

The purpose of this unit is to give students an introductory knowledge of plant parts and their function in growth and development. Students will gain knowledge of cellular organelles and their structure and function. Plant parts and their functional roles in the development of the organism will be discussed with distinctions being made between monocotyledons and dicotyledons.

Goals:
- Know what horticulture is and how it affects daily life.
- Understand the difference in form and function of plant parts (roots, shoots, stems, flowers, etc.).
- Understand the form and function of the cellular components.
- Know what makes a plant cell unique and different from other cells.
- Understand the process of plant fertilization and how pollinators can play a role in this process.

Objectives:
- Define horticulture and list several examples of plants and/or their products that are used on a daily basis.
- Differentiate between monocot and dicot seedlings.
- Identify plant structures both from illustration and specimens.
- Label the different stages of growth of a seed from illustration and specimens.
- List and define the steps in plant fertilization.
- Identify different pollinators and explain their functional role in plant fertilization.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Common Core State Standards.

Teacher will use direct instruction with multimedia presentations, along with Socratic questioning, to relate students' personal experiences with the specific topics they will be studying in the week(s) ahead

The primary driving method in this course is inquiry, wherein students will be challenged with a situation and tasked with analyzing and interpreting their findings/data/research and applying what they have learned to both local and global real life examples. During laboratory activities and investigations, students will work in cooperative groups incorporating both small and large group discussion, as well as cooperative learning.

Finally, student will be expected to synthesize and communicate data and information in the form of scientific writing, graphic organizers, and formal presentations.

The progression of units in this course necessitates that students draw connections between the units and the investigations they have performed. This naturally builds in circular review, which strengthens the depth of knowledge students acquire.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Chapter Assignments—These formative assignments help to build the students foundation for the information they will learn during the unit. Weekly assignments serve to assess and give immediate feedback to the students as to how they are progress in the acquisition of the content knowledge. These assignments inform the instructor as to the progress of the students and allow the instruction of the material to be adjusted, should students need remediation or if they require supplementary instruction.

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Specific labs during this unit include:

- Soil Texture & Classification

Quizzes—These short assignments are used as formative assessment to help the instructor understand whether or not the material covered in class is understood by the students. These are primarily used to assess what is understood by a majority of the students and what areas are in need of emphasis or reteaching.

Tests—These longer assessments are the summative portion of the units and will determine whether or not the over-reaching goals of the units are understood by the students. The information will also help the teacher to redesign learning objectives for the following year and make adjustments to curriculum.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

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EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Environmental Botany** Course Number: **(#0332)**

Unit Title: **Limiting Factors in Plant Growth**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E1.1—Diagram the oxygen, carbon, nitrogen, and water cycles.
E1.5—Analyze the way in which human activities influence energy cycles and natural resource management.
E2.6—Analyze the way in which water management affects the environment and human needs.
E3.1—Demonstrate techniques used to classify soils.
E3.2—Explain the reasons for, and importance of, soil conservation.
E3.3—Analyze soils found in the different natural resource management areas.
E5.2—List habitat requirements for different species and identify factors that influence population dynamics.
E6.4—Analyze the relationship between water quality and aquatic species habitat.
E8.3—Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
E8.4—Recognize and explain the factors that influence plant growth, such as respiration, temperature, nutrients, and photosynthesis.
G3.3—Discern how primary, secondary, and trace elements are used in plant growth.
G3.4—Research the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.
G3.6—Conduct experiment(s) testing the factors that affect plant growth and predict plant response.
G6.2—Analyze soil properties necessary for successful plant production, including pH, electrical conductivity (EC), and essential nutrients.
G6.3—Explain soil biology and diagram the cycles in nature as related to the soil food chain.
G8.4—Explain effective water management and conservation practices, including the use of tailwater ponds.
G9.1—Identify and classify the plants and animals in an agricultural system (as producers, consumers, or decomposers).
G10.1—Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.

Source: Next Generation Science Standards
LS1.C—Organization for Matter and Energy Flow in Organisms
LS2.A—Interdependent Relationships in Ecosystems
LS2.B—Cycles of Matter and Energy Transfer in Ecosystems
LS2.C—Ecosystems Dynamics, Functioning, and Resilience
ESS3.A—Natural Resources

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

Students will study the factors that control growth and development of plants. Students will explore the different needs of plants on an individual basis and determine the effects of limits or excesses of these.

Goals:
- Know what limiting factors for plants are and discuss the relevance of each with respect to growth, development and reproduction.
- Understand that while plants can survive with a low quantity of certain requirements, they will not necessarily thrive.
- Analyze the health and texture of a soil.

Objectives:
- Identify the levels of specific nutrients found in soils using a chemical analysis.

- Specify the relationship between plants and soil structure and nutrients.
- Demonstrate how to set up and properly test a hydroponic system in order to provide plants will all necessary nutrients.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Common Core State Standards.

Teacher will use direct instruction with multimedia presentations, along with Socratic questioning, to relate students' personal experiences with the specific topics they will be studying in the week(s) ahead

The primary driving method in this course is inquiry, wherein students will be challenged with a situation and tasked with analyzing and interpreting their findings/data/research and applying what they have learned to both local and global real life examples. During laboratory activities and investigations, students will work in cooperative groups incorporating both small and large group discussion, as well as cooperative learning.

Finally, student will be expected to synthesize and communicate data and information in the form of scientific writing, graphic organizers, and formal presentations.

The progression of units in this course necessitates that students draw connections between the units and the investigations they have performed. This naturally builds in circular review, which strengthens the depth of knowledge students acquire.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Chapter Assignments—These formative assignments help to build the students foundation for the information they will learn during the unit. Weekly assignments serve to assess and give immediate feedback to the students as to how they are progress in the acquisition of the content knowledge. These assignments inform the instructor as to the progress of the students and allow the instruction of the material to be adjusted, should students need remediation or if they require supplementary instruction.

Projects and Labs—these are the primary foundation for this program and indicate how well a student applies the information covered in the text and lecture with the processes and skills necessary for proper field research. As this is a science based class, it is imperative that students demonstrate application of their knowledge through inquiry and observation. Semester-long projects will incorporate the use of a detailed rubric. Students will receive a copy of the rubric prior to beginning each project, and it will be used in self- and peer-evaluations.

Specific labs during this unit include:

- NPK of Soils
- Salt Tolerance

Quizzes—These short assignments are used as formative assessment to help the instructor understand whether or not the material covered in class is understood by the students. These are primarily used to assess what is understood by a majority of the students and what areas are in need of emphasis or reteaching.

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EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Environmental Botany** Course Number: **(#0332)**

Unit Title: **Plant Energetics**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E1.5—Analyze the way in which human activities influence energy cycles and natural resource management.
E8.3—Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
E8.4—Recognize and explain the factors that influence plant growth, such as respiration, temperature, nutrients, and photosynthesis.
G2.2—Test plant cellular function reactions when plants are grown under different conditions.
G2.6—List which organelles in plant cells carry out photosynthesis.
G3.4—Research the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.
G3.6—Conduct experiment(s) testing the factors that affect plant growth and predict plant response.
G10.1 Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.

Source: Next Generation Science Standards
PS3.D—Energy in Chemical Processes and Everyday Life
LS1.C—Organization for Matter and Energy Flow in Organisms

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

Students will examine the chemistry of photosynthesis and cellular respiration. They will trace the biochemical pathways involved in synthesizing glucose and metabolizing it within a plant cell. Students will apply this knowledge in directing plant growth.

Goals:
- Understand the process and purpose of the two main stages of photosynthesis: the light-dependent reactions and the Calvin Cycle.
- Understand the process and purpose of the three main stages of cellular respiration: glycolysis, the Kreb's Cycle, and the electron transport chain.
- Know how limiting factors impact each of the aforementioned stages.
- Connect the role of plants as producers to other levels in the trophic pyramid of an ecosystem.

Objectives:
- Diagram and describe the main stages, products, reactants of photosynthesis, as well as their locations within the cell.
- Diagram and describe the main stages, products, and reactants of cellular respiration, as well as their locations within the cell.
- Evaluate the relevance of limiting factors at each stage of a plant's metabolic pathway.
- Discuss the loss of energy at each trophic level.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Common Core State Standards.

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Projects and Labs—these are the primary foundation for this program and indicate how well a student applies the information covered in the text and lecture with the processes and skills necessary for proper field research. As this is a science based class, it is imperative that students demonstrate application of their knowledge through inquiry and observation. Semester-long projects will incorporate the use of a detailed rubric. Students will receive a copy of the rubric prior to beginning each project, and it will be used in self- and peer-evaluations.

Specific labs during this unit include:

- Pigment Chromatography
- Wavelengths of Light
- Potato Peroxidase

Quizzes—These short assignments are used as formative assessment to help the instructor understand whether or not the material covered in class is understood by the students. These are primarily used to assess what is understood by a majority of the students and what areas are in need of emphasis or reteaching.

Tests—These longer assessments are the summative portion of the units and will determine whether or not the over-reaching goals of the units are understood by the students. The information will also help the teacher to redesign learning objectives for the following year and make adjustments to curriculum.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Formative assessments, such as chapter review questions and quizzes, will be followed by immediate reteaching through large group discussion and peer tutoring.

Many labs will be conducted over the course of several class periods. At the end of each class period, the teacher will scan the parts students have completed to that point, and clarify or correct misconceptions at the opening of the following period.

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Students who miss entire assignments will have the opportunity to make up work by making appointments with the teacher, during which they can receive one-on-one or small group tutoring.

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Environmental Botany** Course Number: **(#0332)**

Unit Title: **Propagation & Growth**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E8.3—Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
G3.1—Investigate plant systems, nutrient transportation, and energy storage.
G4.2—Demonstrate the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, and seeds).
G9.2—Compare and contrast the elements of conventional, sustainable, and organic production systems.
G10.1—Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.

Source: Next Generation Science Standards
LS1.B—Growth and Development of Organisms

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

Students will know how to direct plant growth through a variety of propagation and pruning techniques. By investigating a variety of methods of plant propagation they will be able to determine the appropriate application for a specific species or environment.

Goals:
- Recognize that plants grow in a variety of patterns.
- Know proper seeding techniques, use of rooting hormone, grafting, pruning, and cross pollination.
- Understand how enzymes and hormones drive growth.

Objectives:
- Compare and contrast herbs, shrubs, and trees.
- Identify growth patterns from living specimens.
- Demonstrate proper seeding, use of rooting hormone, grafting, pruning, and cross pollination.
- Choose appropriate rooting media for different propagation techniques.
- Demonstrate the effects of manipulating levels of hormones on plant growth.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Common Core State Standards.

Teacher will use direct instruction with multimedia presentations, along with Socratic questioning, to relate students' personal experiences with the specific topics they will be studying in the week(s) ahead

The primary driving method in this course is inquiry, wherein students will be challenged with a situation and tasked with analyzing and interpreting their findings/data/research and applying what they have learned to both local and global real life examples. During laboratory activities and investigations, students will work in cooperative groups incorporating both small and large group discussion, as well as cooperative learning.

Finally, student will be expected to synthesize and communicate data and information in the form of scientific writing, graphic organizers, and formal presentations.

The progression of units in this course necessitates that students draw connections between the units and the investigations they have performed. This naturally builds in circular review, which strengthens the depth of knowledge students acquire.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Chapter Assignments—These formative assignments help to build the students foundation for the information they will learn during the unit. Weekly assignments serve to assess and give immediate feedback to the students as to how they are progress in the acquisition of the content knowledge. These assignments inform the instructor as to the progress of the students and allow the instruction of the material to be adjusted, should students need remediation or if they require supplementary instruction.

Projects and Labs—these are the primary foundation for this program and indicate how well a student applies the information covered in the text and lecture with the processes and skills necessary for proper field research. As this is a science based class, it is imperative that students demonstrate application of their knowledge through inquiry and observation. Semester-long projects will incorporate the use of a detailed rubric. Students will receive a copy of the rubric prior to beginning each project, and it will be used in self- and peer-evaluations.

Specific labs during this unit include:

- Plant Hormones

Quizzes—These short assignments are used as formative assessment to help the instructor understand whether or not the material covered in class is understood by the students. These are primarily used to assess what is understood by a majority of the students and what areas are in need of emphasis or reteaching.

Tests—These longer assessments are the summative portion of the units and will determine whether or not the over-reaching goals of the units are understood by the students. The information will also help the teacher to redesign learning objectives for the following year and make adjustments to curriculum.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Formative assessments, such as chapter review questions and quizzes, will be followed by immediate reteaching through large group discussion and peer tutoring.

Many labs will be conducted over the course of several class periods. At the end of each class period, the teacher will scan the parts students have completed to that point, and clarify or correct misconceptions at the opening of the following period.

Semester-long projects will include multiple checkpoints so that the teacher can track students' progress and correct misconceptions. These checkpoints will involve peer evaluation and small-group meetings with the teacher to correct errors and address any challenges that may arise.

Students who miss entire assignments will have the opportunity to make up work by making appointments with the teacher, during which they can receive one-on-one or small group tutoring.

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Environmental Botany** Course Number: **(#0332)**

Unit Title: **Plant Genetics**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E8.3—Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
G2.4—Recognize the part of the cell that is responsible for the genetic information that controls plant growth and development.
G2.5—Summarize plant inheritance principles, including the structure and role of DNA.
G10.1—Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.
G11.3—Assess how herbicide-resistant plant genes can affect the environment.
G11.4—Communicate how genetic engineering techniques have been used to improve crop yields.

Source: Next Generation Science Standards
LS2.C—Ecosystems Dynamics, Functioning, and Resilience
LS3.A—Inheritance in Traits
LS3.B—Variation in Traits

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

Students will study the central dogma of biology, Medellian genetics, and the inheritance patterns specific to plants. They will apply their knowledge to demonstrate how reproduction generates a ratio of possible phenotypes and predict the percentages of these traits. In their studies, student will examine different reproduction strategies and how they impact and influence biodiversity.

Goals:
- Understand the relationship between proteins, DNA and genetic expression.
- Know the requirements for the Hardy Weinburg Equilibrium and calculating population genetics.
- Understand the differences between asexual and sexual reproduction and relate the evolutionary advantages and disadvantages of each.
- Recognize the importance of genetic diversity and how it applies to biodiversity.
- Understand that many of today's agricultural and horticultural products are the result of generations of manipulated genetics through selective breeding.

Objectives:
- Sequence the steps of protein synthesis.
- Apply the base pairing rule to determine DNA and RNA sequences.
- Compare and contrast asexual and sexual reproduction.
- Differentiate between pollination mechanisms and demonstrate them in the greenhouse and field.
- Calculate phenotypic ratio using the HWE equation.
- Discuss how different reproductive strategies influence biodiversity.
- Distinguish between natural and artificial selection.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Common Core State Standards.

Teacher will use direct instruction with multimedia presentations, along with Socratic questioning, to relate students' personal experiences with the specific topics they will be studying in the week(s) ahead

The primary driving method in this course is inquiry, wherein students will be challenged with a situation and tasked with analyzing and interpreting their findings/data/research and applying what they have learned to both local and global real life examples. During laboratory activities and investigations, students will work in cooperative groups incorporating both small and large group discussion, as well as cooperative learning.

Finally, student will be expected to synthesize and communicate data and information in the form of scientific writing, graphic organizers, and formal presentations.

The progression of units in this course necessitates that students draw connections between the units and the investigations they have performed. This naturally builds in circular review, which strengthens the depth of knowledge students acquire.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Chapter Assignments—These formative assignments help to build the students foundation for the information they will learn during the unit. Weekly assignments serve to assess and give immediate feedback to the students as to how they are progress in the acquisition of the content knowledge. These assignments inform the instructor as to the progress of the students and allow the instruction of the material to be adjusted, should students need remediation or if they require supplementary instruction.

Projects and Labs—these are the primary foundation for this program and indicate how well a student applies the information covered in the text and lecture with the processes and skills necessary for proper field research. As this is a science based class, it is imperative that students demonstrate application of their knowledge through inquiry and observation. Semester-long projects will incorporate the use of a detailed rubric. Students will receive a copy of the rubric prior to beginning each project, and it will be used in self- and peer-evaluations.

Specific labs during this unit include:

- Corn Kernel Ratios

Quizzes—These short assignments are used as formative assessment to help the instructor understand whether or not the material covered in class is understood by the students. These are primarily used to assess what is understood by a majority of the students and what areas are in need of emphasis or reteaching.

Tests—These longer assessments are the summative portion of the units and will determine whether or not the over-reaching goals of the units are understood by the students. The information will also help the teacher to redesign learning objectives for the following year and make adjustments to curriculum.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Formative assessments, such as chapter review questions and quizzes, will be followed by immediate reteaching through large group discussion and peer tutoring.

Many labs will be conducted over the course of several class periods. At the end of each class period, the teacher will scan the parts students have completed to that point, and clarify or correct misconceptions at the opening of the following period.

Semester-long projects will include multiple checkpoints so that the teacher can track students' progress and correct misconceptions. These checkpoints will involve peer evaluation and small-group meetings with the teacher to correct errors and address any challenges that may arise.

Students who miss entire assignments will have the opportunity to make up work by making appointments with the teacher, during which they can receive one-on-one or small group tutoring.

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Environmental Botany** Course Number: **(#0332)**

Unit Title: **Pests, Disease and Disturbance**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E7.1—List the potential environmental impacts of recreational activities and describe how to manage the resources affected.
E8.3—Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
E9.1—Differentiate between desirable and undesirable fire in forest and rangeland ecosystems.
G9.2—Compare and contrast the elements of conventional, sustainable, and organic production systems.
E10.6 Identify and diagnose damage from destructive insects, diseases, and weather and choose methods for their management.
G5.1—Demonstrate how to categorize insects as pests, beneficial or neutral, and describe their roles.
G5.2—Explain the role of other pests, such as nematodes, molds, mildews, and weeds.
G5.3—Compare and contrast conventional, sustainable, and organic management methods to prevent or treat plant disease symptoms.
G5.4—Use integrated pest management to prevent, treat, and control plant disease symptoms (including conventional, sustainable, and organic management methods).
G5.5—Research how biotechnology can be used to manage pests.
G9.1—Identify and classify the plants and animals in an agricultural system (as producers, consumers, or decomposers).
G10.1—Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.
G11.1—Research how changing technology, such as micro-propagation, biological pest controls, and genetic engineering (including DNA extraction and gel electrophoresis), affects plant production, yields, and management.
G11.3—Assess how herbicide-resistant plant genes can affect the environment.
G11.4—Communicate how genetic engineering techniques have been used to improve crop yields.

Source: Next Generation Science Standards
LS2.A—Interdependent Relationships in Ecosystems
LS2.B—Cycles of Matter and Energy Transfer in Ecosystems
LS2.C—Ecosystems Dynamics, Functioning, and Resilience
ESS3.A—Natural Resources

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

During this unit students will become familiar with common ailments that affect plants. They will study pests from a variety of kingdoms and utilize known best practices to study how to control the outbreak and spread of said infections. Students will take a practical approach, using guides and online references to identify pests and diseases that commonly affect economically valuable species. In this section, students will also gain an understanding of how human development and pressure has created an ecological impact as well as the steps that could be taken to correct and prevent these impacts.

Goals:

- Know the differences between insects, viruses, bacteria and fungi.
- Observe a plant and determine the nature of disease that it exhibits.
- Know where symptoms of disease could or will occur.
- Know the advantages and disadvantages of different categories of pesticides, herbicides, and biological controls.

- Understand the different stages of succession with particular emphasis on how edge effects can affect these rates of change.
- Recognize the benefits and detriments of invasive species.

Objectives:
- Categorize pests and diseases based on their taxonomy and visual disturbances/effects on plants.
- Compare and contrast viruses, bacteria, and fungi.
- Identify several common plant diseases using visual observation techniques.
- Choose appropriate control measures for specific ailments.
- List and identify the different steps of succession.
- Determine the impacts of edge effect on a wildland or agricultural area.
- Explain the effect that invasive species can have on local biodiversity.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Common Core State Standards.

Teacher will use direct instruction with multimedia presentations, along with Socratic questioning, to relate students' personal experiences with the specific topics they will be studying in the week(s) ahead

The primary driving method in this course is inquiry, wherein students will be challenged with a situation and tasked with analyzing and interpreting their findings/data/research and applying what they have learned to both local and global real life examples. During laboratory activities and investigations, students will work in cooperative groups incorporating both small and large group discussion, as well as cooperative learning.

Finally, student will be expected to synthesize and communicate data and information in the form of scientific writing, graphic organizers, and formal presentations.

The progression of units in this course necessitates that students draw connections between the units and the investigations they have performed. This naturally builds in circular review, which strengthens the depth of knowledge students acquire.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Chapter Assignments—These formative assignments help to build the students foundation for the information they will learn during the unit. Weekly assignments serve to assess and give immediate feedback to the students as to how they are progress in the acquisition of the content knowledge. These assignments inform the instructor as to the progress of the students and allow the instruction of the material to be adjusted, should students need remediation or if they require supplementary instruction.

Projects and Labs—these are the primary foundation for this program and indicate how well a student applies the information covered in the text and lecture with the processes and skills necessary for proper field research. As this is a science based class, it is imperative that students demonstrate application of their knowledge through inquiry and observation. Semester-long projects will incorporate the use of a detailed rubric. Students will receive a copy of the rubric prior to beginning each project, and it will be used in self- and peer-evaluations.
Specific labs during this unit include:
- Soil Flora & Fauna: Capture & Identification
- Soil Flora & Fauna: Inoculants

Quizzes—These short assignments are used as formative assessment to help the instructor understand whether or not the material covered in class is understood by the students. These are primarily used to assess what is understood by a majority of the students and what areas are in need of emphasis or reteaching.

Tests—These longer assessments are the summative portion of the units and will determine whether or not the over-reaching goals of the units are understood by the students. The information will also help the teacher to redesign learning objectives for the following year and make adjustments to curriculum.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Formative assessments, such as chapter review questions and quizzes, will be followed by immediate reteaching through large group discussion and peer tutoring.

Many labs will be conducted over the course of several class periods. At the end of each class period, the teacher will scan the parts students have completed to that point, and clarify or correct misconceptions at the opening of the following period.

Semester-long projects will include multiple checkpoints so that the teacher can track students' progress and correct misconceptions. These checkpoints will involve peer evaluation and small-group meetings with the teacher to correct errors and address any challenges that may arise.

Students who miss entire assignments will have the opportunity to make up work by making appointments with the teacher, during which they can receive one-on-one or small group tutoring.

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Environmental Botany** Course Number: **(#0332)**

Unit Title: **Classification**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E8.1—Use scientific method to classify animals, including order, family, genus, and species.
E8.2—Use a dichotomous key to identify plants and animals.
E8.3—Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
G1.1—Classify and identify plants by order, family, genus, and species.
G1.2—Practice how to identify plants by using a dichotomous key.
G1.3—Demonstrate how common plant parts are used to classify the plants.
G1.4—Communicate the differences between, and uses of, native and nonnative plants.
G1.5—Distinguish the differences between monocots and dicots.
G1.6—Explain the differences between plants under production and weeds.
G10.1—Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

In the final unit of the course, students will utilize their learned information to apply their knowledge in identifying plants based on the characteristics they express. Students will utilize the biologic classification system to distinguish plants from other organisms as well as from one another. From using leaf spacing and type, to stem structure and flowers or spores, students will be able to take an unknown plant and apply what they have learned to correctly identify the plant.

Goals:
- Understand the biological classification system.
- Know the defining characteristics of the major plant phyla.
- Understand the differences between monocots and dicots.
- Know where to look for flowers or spores on a plant.
- Understand the steps necessary to identify a plant based on its observable characteristics

Objectives:
- Qualitatively read a phylogenetic tree and place plants in their proper evolutionary sequence.
- Use a dichotomous key to correctly identify the phyla of certain plants.
- Compare and contrast monocots and dicots in their adult form.
- Use identification markers to key out plants into their phylum, class, order, family and genus.
- Differentiate between flowers and spores and be able to point them out on their respective plants.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Common Core State Standards.

Teacher will use direct instruction with multimedia presentations, along with Socratic questioning, to relate students' personal experiences with the specific topics they will be studying in the week(s) ahead

The primary driving method in this course is inquiry, wherein students will be challenged with a situation and tasked with analyzing and interpreting their findings/data/research and applying what they have learned to both local and global real life examples. During laboratory activities and investigations, students will work in cooperative groups incorporating both small and large group discussion, as well as cooperative learning.

Finally, student will be expected to synthesize and communicate data and information in the form of scientific writing, graphic organizers, and formal presentations.

The progression of units in this course necessitates that students draw connections between the units and the investigations they have performed. This naturally builds in circular review, which strengthens the depth of knowledge students acquire.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Chapter Assignments—These formative assignments help to build the students foundation for the information they will learn during the unit. Weekly assignments serve to assess and give immediate feedback to the students as to how they are progress in the acquisition of the content knowledge. These assignments inform the instructor as to the progress of the students and allow the instruction of the material to be adjusted, should students need remediation or if they require supplementary instruction.

Projects and Labs—these are the primary foundation for this program and indicate how well a student applies the information covered in the text and lecture with the processes and skills necessary for proper field research. As this is a science based class, it is imperative that students demonstrate application of their knowledge through inquiry and observation. Semester-long projects will incorporate the use of a detailed rubric. Students will receive a copy of the rubric prior to beginning each project, and it will be used in self- and peer-evaluations.

Specific labs during this unit include:

- Flower & Fruit Dissection
- Evolutionary Relationships

Quizzes—These short assignments are used as formative assessment to help the instructor understand whether or not the material covered in class is understood by the students. These are primarily used to assess what is understood by a majority of the students and what areas are in need of emphasis or reteaching.

Tests—These longer assessments are the summative portion of the units and will determine whether or not the over-reaching goals of the units are understood by the students. The information will also help the teacher to redesign learning objectives for the following year and make adjustments to curriculum.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Formative assessments, such as chapter review questions and quizzes, will be followed by immediate reteaching through large group discussion and peer tutoring.

Many labs will be conducted over the course of several class periods. At the end of each class period, the teacher will scan the parts students have completed to that point, and clarify or correct misconceptions at the opening of the following period.

Semester-long projects will include multiple checkpoints so that the teacher can track students' progress and correct misconceptions. These checkpoints will involve peer evaluation and small-group meetings with the teacher to correct errors and address any challenges that may arise.

Students who miss entire assignments will have the opportunity to make up work by making appointments with the teacher, during which they can receive one-on-one or small group tutoring

Appendix I: Semester Projects

Each Semester will culminate in a project that incorporates and summarizes the previously covered topics. Students will synthesize information based on their reading, laboratory and hands-on investigations, and class discussion to show mastery of the concepts and objectives they have learned. These projects are as follows:

Semester 1: Plant Biomes

The purpose of this three part project is to help students understand the diverse and unique nature of how plants grow and their unique characteristics and adaptations based on the biome in which they live.

> Part 1: Students will identify, distinguish between, and identify specific plants endemic to the different biomes. They will research and present their information as a basis for the remainder of the project.
>
> Part 2: The next stage of the project will involve students choosing a biome and finding plant(s) that they are interested in growing from within that biome. They will complete and present a research paper/visual presentation in which they identify the important growth characteristics and limiting factors for their chosen plants.
>
> Part 3: Finally, students will acquire a cutting, seed or starter of their chosen species and proceed to grow it. During this data driven portion of the project, students will keep records on growth, watering rates, solar incidence, nutrient levels, and overall health and vigor of their plants.

At the end of the semester, students will present their information, data and graphs, trends, a discussion of problems and successes, as well as comparing and contrasting the plants that their peers produced. Students will identify adaptations and specific growth aspects of their and their peers' plants that make them unique to their specific biome. The plants they cultivated will become part of a permanent collection.

Content Area Standards:
Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E1.1—Diagram the oxygen, carbon, nitrogen, and water cycles.
E5.2—List habitat requirements for different species and identify factors that influence population dynamics.
E6.1—Summarize the different types of aquatic resources.
E8.4—Recognize and explain the factors that influence plant growth, such as respiration, temperature, nutrients, and photosynthesis.
G1.1—Classify and identify plants by order, family, genus, and species.
G3.4—Research the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.
G4.2—Demonstrate the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, and seeds).
G6.4—Research how soil biology affects the environment and natural resources.
G9.1—Identify and classify the plants and animals in an agricultural system (as producers, consumers, or decomposers).

Semester 2: Landscape Design/Architecture

The purpose of this project is to have students produce an illustrated and labeled 2D, 3D, or computer model that utilizes a known space to develop a landscape design. Students will be tasked with using their knowledge and applying it to a known space with hypothetical constraints from a fictitious client. They will include topographic considerations, electrical, irrigation/watering zones and times, drainage, soil types and amendments, access/habitat for people and/or animals, hardscaping, water features, plants and a functional budget.

Students will have check in points for each of the aforementioned pieces of the project in which they will complete a schematic for each stage of completion (i.e. electrical runs, irrigation, drainage, etc.) as well as a research paper outline justifying their choices.

The project will culminate in groups presenting their final proposals to a panel of judges who will play the role of the "clients". Each presentation will require the step-by-step schematics, an initial and final schematic, the justifications for their choices at each stage, as well as reasoning behind changes that were made as the project

progressed.

Content Area Standards:
Source: California Career Technical Education Model Curriculum Standards, Agriculture and Natural Resources: Forestry and Natural Resources Pathway (E) and Plant and Soil Science Pathway (G)

E8.3—Identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
E8.4—Recognize and explain the factors that influence plant growth, such as respiration, temperature, nutrients, and photosynthesis.
E10.6—Identify and diagnose damage from destructive insects, diseases, and weather and choose methods for their management.
G1.1—Classify and identify plants by order, family, genus, and species.
G1.2—Practice how to identify plants by using a dichotomous key.
G1.3—Demonstrate how common plant parts are used to classify the plants.
G1.4—Communicate the differences between, and uses of, native and nonnative plants.
G3.4—Research the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.
G6.1—Understand soil types, soil texture, structure, and bulk density and explain the U.S. Department of Agriculture (USDA) soil-quality rating procedure.
G7.1—Plan how to effectively manage and conserve soil through conventional, minimum, conservation, and no-tillage irrigation and through drainage and tillage practices.
G8.4—Explain effective water management and conservation practices, including the use of tailwater ponds.
G10.1—Practice local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.

Source: Next Generation Science Standards
ETS1.A—Defining and Delimiting an Engineering Problem
ETS1.B—Developing Possible Solutions
ETS1.C—Optimizing the Design Solution
ETS 2.A—Interdependence of Science, Engineering, and Technology
ETS2.B—Influence of Engineering, Technology, and Science on Society and the Natural World