Western Technical College

10006129 Introductory Plant Science

Course Outcome Summary

Course Information

Description	Provides fundamental knowledge of plant components and their functions. Topics include pollinating and propagating plants, germinating seeds, plant nutrients and factors affecting photosynthesis, respiration and tranpiration. We will investigate how these functions help the plant sustain itself. Participants will experience plant components and their functions through the completion of hands-on activities.
Career Cluster	Agriculture, Food and Natural Resources
Instructional Level	Associate Degree Courses
Total Credits	3
Total Hours	72

Textbooks

How Plants Work: The Science Behind the Amazing Things Plants Do. Chalker-Scott, Linda. Copyright 2015. Publisher: Hachette Book Group USA. **ISBN-13:** 978-1-60469-338-6. Required.

Program Outcomes

1. Interact as a professional in Agribusiness
2. Investigate opportunities in Agribusiness
3. Apply relevant technologies
4. Create a Crop Management Plan

Course Competencies

1. Investigate plant classification systems.

Criteria

You will know you are successful when

1.1. you identify the terminology of the scientific classification system for plants.
1.2. you identify the scientific name of common crops and weeds.
1.3. you identify major characteristics of plant families.
1.4. you identify the plant family of common crops and weeds.
1.5. you identify agronomic classifications (cereal, grain, forage, etc.).
1.6. you identify plant life cycle categories of summer annual, winter annual, biennial, and perennial.
1.7. you classify common crops and weeds according to its plant life cycle category.

Learning Objectives

1.a. Explain the plant classification system.
1.b. Distinguish among the various classification systems.
1.c. Recognize plant life cycle categories--summer annual, winter annual, biennial, and perennial.

2. Identify the anatomy of plants.

Criteria

You will know you are successful when

2.1. you identify the parts of a flower, including make and female flower parts.
2.2. you explain the difference between the flowers of monocot and dicot plants.
2.3. you identify the parts of a root.
2.4. you describe different root systems and structures.
2.5. you identify the parts of a stem.
2.6. you describe the stems of monocot and dicot plants.
2.7. you identify bud types and locations.

Learning Objectives

2.a. Describe the role of the flower to a plant.
2.b. Identify the parts of a flower.
2.c. Describe the functions of male and female flower parts.
2.d. Compare the flowers of monocot and dicot plants.
2.e. Identify the parts of a root--cortex, hairs, epidermis, cap, pith and endodermis casparian strip.
2.f. Describe the functions of each part of the root.
2.g. Compare tap and fibrous root systems.
2.h. Compare root structures of monocot and dicot plants.
2.i. Identify the parts of a stem--phloem, xylem, pith, cortex, epidermis, vascular bundles and meristem.
2.j. Describe the function of each part of the stem.
2.k. Compare stems of monocot and dicot plants.
2.l. Identify bud types and locations.
2.m. Explain the functions of root anchorage and storage.

3. Examine factors impacting plant physiology.

Criteria

You will know you are successful when

3.1. you write the chemical equation for respiration.
3.2. you describe physical and environmental factors affecting rate of respiration.
3.3. you explain the process and product of glycolysis.
3.4. you compare the inputs and outputs of photosynthesis and respiration
3.5. you describe how respiration and photosynthesis impacts field crops throughout the four seasons.
3.6. you describe the process of transpiration.
3.7. you list factors affecting transpiration.
3.8. you compare transpiration rates at night vs. day.
3.9. you identify by-products of photosynthesis.
3.10. you explain how light, amount of water, carbon dioxide, and temperature can affect photosynthesis.

Learning Objectives

3.a. Describe the process of respiration.
3.b. Describe how the various factors affect respiration--temperature, oxygen, water and wind.

3.c. Describe how the process of respiration relates to photosynthesis.
3.d. Identify weather related factors affecting photosynthesis and respiration.
3.e. Outline the process of transpiration.
3.f. Explain how the number of leaves and the size of leaves affect the rate of transpiration.
3.g. Identify other factors that affect the rate of transpiration: wind, temperature and humidity.
3.h. Determine the effects of light quality, intensity and duration on transpiration.
3.i. Explain the effect light has on a stomata.
3.j. Write the chemical equation for the process of photosynthesis.
3.k. Describe the process of photosynthesis.
3.l. Identify factors that affect photosynhesis.
3.m. Describe the effects of light quality, intensity and duration on photosynthesis.
3.n. Describe the effects of temperature on photosynthesis.
3.o. Describe the role water plays in photosynthesis.

4. Examine how to germinate seeds.

Learning Objectives

4.a. Describe the functions of the three primary parts of a seed: the seed embryo, the food reserve tissues and the seed coat.
4.b. Compare seed germination or monocot and dicot plants.
4.c. Describe the three primary stages of germiantion..
4.d. Explain the factors that affect germination: light, water, temperature, oxygen and plant depth.
4.e. Identify how each factor affecting germination can be controlled.
4.f. Discuss the concepts of stratification and scarification.
4.g. Explain why it is important to know the seed viability.
4.h. Explain why it is important to know the germination capacity of a seed lot.
4.i. Determine seed rates necessary to achieve desired planting populations based on germination percentage.

5. Explore asexual and sexual plant reproduction.

Criteria

You will know you are successful when

5.1. you distinguish common plants/crops and their method of reproduction.
5.2. you outline the process of plant propagation.
5.3. you identify the main components of sexual reproduction in plants.
5.4. you describe common agricultural crops and their reproduction techniques.

Learning Objectives

5.a. Distinguish between sexual and asexual reproduction.
5.b. Identify types of axexual reproduction.
5.c. Explain uses of asexual reproduction.
5.d. Give examples of the different types of propagation.
5.e. Outline procedures for common types of propagation.
5.f. Identify common inflorescence types of flowers found in monocot and dicot plants.
5.g. Compare plant breeding systems: selection, hybridization (or cross breeding), inbreeding and backcrossing.
5.h. Describe plant breeding techniques.
5.i. Compare self-pollination and cross-pollination processes.
5.j. Explain the processes of ovule and pollen development.
5.k. Outline sexual reproduction in plants.

6. Analyze plant emergence.

Criteria

You will know you are successful when

6.1. you identify component parts of seeds, seedlings, and emerged plants.
6.2. you differentiate between the emergence process for monocots and dicots.

Learning Objectives

6.a. Identify the component parts of a seed, a seedling and above ground parts of a plant.
6.b. Describe emergence.

6.c. Describe the impact of geotropism.
6.d. Compare hypogeal and epigeal emergence.
6.e. Determine seed rates necessary to achieve desired planting populations.
6.f. Describe the impact of various physical and environmental conditions on plant seedling emergence.

7. Explain nutrient and water uptake in a plant.

Criteria

You will know you are successful when

7.1. you describe how plants take up water and nutrients.
7.2. you generalize environmental impacts on nutrient uptake.
7.3. you explain cellular function of nutrient uptake.
7.4. you identify plant structures that impact nutrient/water uptake.

Learning Objectives

7.a. Describe osmosis and diffusion.
7.b. Identify environmental factors that affect nutrient uptake.
7.c. Explore the role of nitrogen-fixation in nutrient uptake.
7.d. Examine cellular structure of plants
7.e. Evaluate growth in plant parts that aid in nutrient movement
7.f. Differentiate cellular function in mature plants
7.g. Predict plant ability to move water/nutrients based on environment

8. Manage factors that affect plant growth.

Learning Objectives

8.a. Categorize the 17 essential nutrients of plants.
8.b. Predict effect of variable levels of the three primary elements.
8.c. Discuss physical and environmental facors that affect plant growth: light, temperature and soil conditions.
8.d. Discuss methods to manage the factors that affect plant growth (e.g. tillage practices, spacing, competition, irrigation, etc.)
8.e. Describe the various tropisms: geotropisms, phototropism and thigmotropism.

9. Examine changes occuring in the Plant Science Industry due to emerging technology

Criteria

You will know you are successful when

9.1. you identify at least three benefits or advantages of GMO plant production from agribusiness and the green industry standpoint.
9.2. you explain the impact of GMOs on production and profit.
9.3. you identify characteristics of a crop that exhibit specific plant traits.
9.4. you describe dominant characteristics based on traits.
9.5. you predict the offspring of a genetic cross.

Learning Objectives

9.a. Identify desired characteristics in common crops.
9.b. Describe how dominant and recessive genes affect plant characteristics.
9.c. Explain the basic principles of genetics.
9.d. Apply the principles of simple Mendelian genetics.
9.e. Show how a Punnet Square can help to predict the phenotypes of offspring.
9.f. Explain the impact of GMOs (genetically modified organisms) on agribusiness and the green industry.

10. Identify common agronomic crops of economic importance in Wisconsin and Minnesota

Learning Objectives

10.a. Match common field crops and vegetables to life cycle categories.
10.b. Compare morphological characteristics of common agronomic crop plants.
10.c. Discuss the economic importance of agronomic and specialty crops to Wisconsin's economy.