COURSE NUMBER:	Agri-211
COURSE TITLE:	Crop Science
CREDIT HOURS:	(4) four
INSTRUCTOR:	Derek Dick
OFFICE LOCATION:	116 Weinberg Hall
OFFICE HOURS:	As posted
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PREREQUISITES:	None
REQUIRED TEXT:	*Introductory Crop Science, 4th edition* *by Richards Waldren* Handouts and extension bulletins provided
COURSE DESCRIPTION:	Basic production principles for agronomic crops, including corn, soybeans, sorghum, wheat, native and forage grasses. Culture needs of various crops, crop rotations, soil preparation and fertilization, selecting varieties, preventing pests, harvesting and storing crops. Three hours lecture and two hours lab per week.
EXPECTED LEARNER OUTCOMES:	1. The student will distinguish major crops by botanical relationships, climate and soil preferences, culture, and uses. 2. The student will select crop types, varieties and rotations for various regions, economic factors and pest problems. 3. The student will become familiar with tillage and other cultural practices used in the production of agronomic crops. 4. The student will determine seed quality and seeding rates, and understand the planting process, and seed germination. 5. The student will understand crop growth and development and their interrelationships with agronomic practices and yields.

6. The student will assess soil pH needs of crops and response to fertilizers and irrigation.
7. The student will become familiar with cultural, biological, physical, genetic, and chemical methods of preventing and controlling crop pests and with integrated pest management.
8. The student will understand crop ripening, maturity tests, and procedures for harvesting, curing and storing crops.
9. The student will understand the goals of sustainable agriculture, and incorporate low-input techniques.

LEARNING TASKS & ACTIVITIES:

Students will distinguish major crops and plants based on their intended use. Students will become familiar with tillage and cultural practices used in the production of crops and forages. Soil fertility will be assessed and the seeding and grazing practices will be discussed. Students will understand plant growth and development.

ASSESSMENT OF OUTCOMES:

Three one hour exams, 16 laboratory assignments, 10 random quizzes, and one comprehensive final examination will be used to assess each student's cognitive comprehension of the lecture and lab topics. The following points will be assigned to each evaluation.

Three one hour examinations	300
One final examination	100
Laboratory assignments	320
Quizzes	200
Total	920

Grades will assigned as follows

90-100 A
80-89 B
70-79 C
60-69 D
59 or below F

ATTENDANCE POLICY

Attendance at all class meeting times is required. All laboratories will be held in the college greenhouse, and all assignments must be completed

during the scheduled laboratory meeting time and all quizzes, tests and exams must be taken at scheduled times unless the student has an excused absence and makes arrangements with the instructor before the student missed the scheduled class. All cell phones or pagers must be turned of in the classroom or the student will be asked to leave.

CROP SCIENCE
SPECIFIC LEARNER OUTCOMES EXPECTED

I. The student will distinguish major crops by botanical relationships, climate and soil preferences, culture and uses.

1. Categorize major crops by their botanical families. (analysis)
2. Determine the identity of grass seedlings, both crops and weeds, by their auricles, ligules, collars, blades and sheaths. (evaluation)
3. Determine the identity of legume crops and weeds by their flowers and leaf arrangement, and determine whether leaves are simple, pinnately compound or palmately compound.
4. Categorize major crops by their region of origin and its climate. (analyze)
5. Differentiate major crops by their climate and soil preferences. (analysis)
6. Categorize major crops as winter annuals, summer annuals, biennials or perennials. (analysis)
7. Match major crops with their most common uses as starch crops, oil crops, high-protein crops, animal feeds and forages. (comprehension)

II. The student will select crop types, varieties and rotations for various regions, economic factors and pest problems.

1. Calculate growing degree days provided in various regions and seasons, and select crops and varieties for these regions based on their heat requirements. (application)
2. Compare various types of cropping systems such as monoculture, rotation cropping, relay cropping, double cropping, intercropping and strip cropping. (evaluation)
3. Discuss the benefits of crop rotation for reducing soil erosion, improving soil tilth, and increasing soil organic matter and nitrogen reserves. (comprehension)
4. Discuss the benefits of crop rotation for control of weeds, insects and diseases. (comprehension)
5. Assess the benefits and drawbacks of using nurse crops to establish forage crops. (evaluation)

6. Design cropping systems and rotations suited for various regions, economic factors and pest problems. (synthesis)
7. Describe the importance of plant diseases in determining distribution of various types of crops and varieties. (comprehension)
8. Select varieties of wheat and other crops with good agronomic qualities, adaptation to climate and soil conditions, and resistance to prevalent diseases and insect pests of various regions. (application)

III. The student will become familiar with tillage and other cultural practices used in the production of agronomic crops.

1. Compare conventional, ridge-tillage and other cultural practices used in the production of agronomic crops. (evaluation)
2. Observe conventional and reduced tillage equipment and operations. (application)
3. Compare the effects of moldboard and chisel plowing, and the adaptation of each to various types of soils. (evaluation)
4. Describe five purposes of soil tillage. (comprehension)
5. Outline techniques that can substitute for tillage in achieving each of these aims: loosening soil, mixing in fertilizers, and controlling weeds, soil insect pests and diseases. (application)
6. Estimate residue cover from corn, sorghum or soybeans by the line-transect method and the photo-comparison method. (application)
7. Outline four guidelines for ridge layout, three for ridge planting, and three for ridge maintenance in ridge tillage systems. (application)
8. Decide the best planting dates for various agronomic crops. (application)

IV. The student will determine seed quality and seeding rates, and understand the planting process and seed germination.

1. Determine seed quality for seed samples of several crops based on purity, weed seed content, freedom from disease, germination percentage and vigor. (evaluation)
2. Describe the goals of a seed certification program, and the four classes of seed in the program. (comprehension)
3. Identify the major structures of legume seed and grass cayopsis, and explain their functions. (comprehension)
4. Compare epigeal emergence of soybeans, beans and some other legumes with hypogeal emergence of grasses, peas and vetches. (evaluation)
5. Analyze how method of emergence and environmental conditions influence planting depth of corn, small grains and soybeans. (analysis)
6. Describe how soil conditions, weather, planting date, cultural practices, and seed treatment can affect seedling emergence. (analysis)
7. Determine proper seeding rates various crops based on desired per-acre plant populations and row widths, based on 90 % seed germination and 90 % emergence and on reduced emergence due to adverse environmental factors. (application)
8. Describe five functions of crop planting equipment. (comprehension)
9. Calibrate and operate a row crop planter or grain drill. (application)

V. The student will assess soil pH needs of crops, and responses to fertilizers and irrigation.

1. Explain why some soils are acidic, why most plants grow poorly in acidic soils, and how some plants are adapted to them. (comprehension)
2. Match common agronomic crops with their soil pH needs. (comprehension)
3. Test soil pH and apply lime or acidifying materials, if needed, according to the tests and the needs of particular plants. (synthesis)
4. Rate various legume crops for their nitrogen-fixing ability. (evaluation)
5. Calculate fertilizer needs for various crops based on yield goals, rotations, soil nutrient tests, and previous fertilizer and manure additions. (application)
6. Differentiate between various fertilizer application methods including broadcast, banding, starter fertilizer, sidedressing, and fertigation. (analysis)
7. Match each of these fertilizers as being acid-forming, slightly base-forming or neutral: superphospate, potassium nitrate, potassium chloride, diammonium phosphate, calcium nitrate, ammonium sulfate. (comprehension)
8. Outline three methods of reducing evapotranspiration in crops. (application)
9. Describe three factors influencing irrigation water quality. (comprehension)
10. Calculate the frequency of irrigation needed in several crop and soil situations, using various irrigation methods. (application)

IV. The student will understand crop growth and development and their interrelationships with agronomic practices and yields.

1. Compare the type of root system of monocots and dicots, and the effectiveness of each in decreasing soil erosion. (evaluation)
2. Describe the effects of soil compaction on root growth, and ways to reduce compaction. (comprehension)
3. Describe the environmental conditions that cause winter root heaving of perennial or winter crops, and its harmful effects on them. (comprehension)
4. Choose the type of root system most susceptible to winter heaving, and cultural practices that reduce winter heaving. (application)
5. Explain the importance of making a last alfalfa or clover hay cutting no later than four weeks before the first hard freeze. (comprehension)
6. Compare the photosynthetic rate and net assimilation rate of C3 and C4 plants under various temperature and moisture conditions, and name examples of C3 and C4 agronomic crops. (evaluation)
7. Estimate yield losses in corn due to various levels of defoliation from hail or other causes, at various growth stages. (evaluation)
8. Identify legume and grass flowering structures and explain their functions. (comprehension)

VII. The student will become familiar with cultural, biological, physical, genetic, and chemical methods of preventing and controlling crop pests, and with integrated pest management.

1. Compare tillage with herbicide treatments to control various types of weeds, in terms of effectiveness, costs, effects on soil water, and effects on current and future crops. (evaluation)
2. Define the economic injury level for a crop and the economic threshold for a pest population, and explain why these can vary with the expected yield and profit for the crop, the cost and effectiveness of treatments, and other factors. (comprehension)
3. Monitor populations of several insect pests using pheromone traps, sweep nets, leaf and stem counts, and other methods. (application)
4. Use degree-day models to predict growth and development of crops and insect pests, and determine the need for and timing of pesticide treatments. (application)
5. Determine the extent of disease damage using visual keys and spore traps. (application)
6. Use computer models to predict development of fungal diseases, and determine the need for and timing of fungicide treatments. (application)
7. Sample soil and plant roots for nematode pests, and determine if populations exceed threshold levels and require treatment. (applications)
8. Diagnose ten crop diseases and herbicide injuries from visual symptoms, macroscopic and microscopic signs. (evaluation)
9. Determine the identity of ten arthropod pests and three beneficial arthropods. (evaluation)
10. Identify the common insect pests and diseases of major crops. (knowledge)

VIII. The student will understand crop ripening, maturity tests, and procedures for harvesting, curing and storing crops.

1. Determine physiological maturity of a grain crop based on abscission layer formation, grain moisture content, and accumulated heat units. (evaluation)
2. Differentiate between physiological maturity of a crop and harvest maturity. (analysis)
3. Determine harvest maturity of a grain crop based on moisture content. (evaluation)
4. Determine harvest maturity of a forage crop based on maturity stage, leafiness and digestibility. (evaluation)
5. Label and describe the major components of a combine. (comprehension)
6. Measure harvest losses of soybeans, grain sorghum or corn. (application)
7. Discuss three ways to reduce machine harvest losses. (comprehension)
8. Determine moisture contents and test weights for harvested grain and soybeans samples, and grade the samples based on amount of foreign material, cracks or splits, heat damage, total damage, and other factors. (evaluation)
9. Compare pros and cons of three methods of storing hay. (evaluation)
10. Match grains, silage, haylage and hay with the proper moisture content for storing each. (comprehension)

IX. The student will appreciate the goals of sustainable agriculture, and incorporate low-input techniques and appropriate techniques from other types of world agricultural systems into a farm management plan.

1. Outline three ways of reducing water erosion of soils and three ways of reducing wind erosion. (application)
2. Compare the amount of erosion from perennial and annual crops. (evaluation)
3. Outline four ways to control soil erosion from rangelands. (application)
4. Describe the process of eutrophication of surface waters, and how poor soil management can aggravate this problem. (comprehension)
5. Outline four methods of minimizing water pollution due to nitrate leaching from fertilized soils. (application)
6. Calculate the amount of manure that can be added to a soil to supply a crop's nitrogen needs without polluting surface or groundwaters. (synthesis)
7. Outline three ways to reduce pesticide use while maintaining or improving profits in production of an agronomic crop. (synthesis)
8. Outline three ways to reduce fuel costs while maintaining or improving profits in production of an agronomic crop/ (synthesis)

X. The student will learn production basics for major crops, and methods of crop improvement.

1. Describe general cultural practices for major crops including wheat, corn, sorghum, soybeans, alfalfa, clovers and fescue. (comprehension)
2. Compile an in-depth report on production of one agronomic crop. (synthesis)
3. Categorize different types of wheat including winter vs. spring wheats, hard vs. soft wheats, red vs. white wheats, and specialty wheats such as durum and club wheats. (analysis)
4. Categorize different types of corn including dent, flint, flour, sweet and popcorn. (analysis)
5. Categorize different types of sorghum including grain, forage, cane (syrup), broomcorn, shattercane and johnsongrass. (analysis)
6. Discuss the importance of inoculating soybeans, alfalfa, clovers and other legumes with *Rhizobium* bacteria, and describe two methods of accomplishing this. (comprehension)
7. Categorize various species of clovers based on their adaptation to various climates, soil types and water regimes. (analysis)
8. Appraise the problems caused by fescue infected with an endophyte fungus, and the benefits of planting endophyte-free seed. (evaluation)
9. Differentiate among natural, mass, and pure line selection techniques for crop improvement. (analysis)
10. Describe the principal hybridization techniques used to produce self- and cross-pollinated crops. (comprehension)
11. Outline techniques used to produce corn hybrids. (application)

Week 1: Chapter 1, 2 Development of Agriculture and Terminology
Lab: Seed germination and ID

Week 2: Chapter 3, Agro ecology
Lab: Plant Structure

Week 3: Review, Test, Chapter 4
Lab: Seed ID

Week 4: Chapter 4, 5, Production systems, soils
Lab: No Lab

Week 5: Chapter 6, Seeds and Seeding
Lab: Plant Structures

Week 6: Chapter 7, Roots
Lab: Root structures

Week 7: Review, Test
Lab: Farmland Tour

Week 8: Chapter 8, Crop Stems and Leaves
Lab: Seed ID

Week 9: Chapter 9 Photosynthesis and Respiration
Lab: Photosynthesis Lab

Week 10: Chapter 10, Flowering and Reproduction
Lab: Farmland Tour

Week 11: Chapter 11, Crop Improvement
Lab: Field Tour

Week 12: Review Test
Lab: GPS Lab

Week 13: Chapter 12, Climate, weather, crops
Lab: Seed ID

Week 14: Chapter 13-15 Crop Pests, Diseases and weed control
Lab: Chemical Application Lab

Week 15: Grazing Systems
Lab: Problem set

Week 16: Review, Final