OVERVIEW

The following information will appear in the 2016 - 2017 catalog

AGM 235—IRRIGATION AND DRAINAGE

36.00 Lecture Hours, 54.00 Lab Hours

Irrigation and drainage problems that focus on soil-plant-water relationships, application scheduling, evapotranspiration, and efficiency. Introduction to irrigation equipment and technology to include water measurement, soil moisture measurement, pumping and delivery systems, and various irrigation methods. California water infrastructure, water budget, water rights and legislation. Field trips are required. Not repeatable. (A-F Only) Transfer: (CSU)

II. LEARNING CONTEXT

Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goal specified in Section III, Desired Learning:

A. COURSE CONTENT

1. Required Content:

   A. California Water

      1. State water budget

         a. Water supply origins and governmental projects
         b. Water storage and delivery
         c. Water usage

      2. Water Rights

         a. Riparian rights
         b. Appropriate rights

      3. Water legislation

   B. Irrigation Systems

      1. Surface irrigation

         a. Border strip and flood
         b. Furrow
2. Sprinkler Irrigation
   a. Permanent set
   b. Movable lines
   c. Wheel lines
   d. Center pivot
   e. Water canon

3. Micro Irrigation
   a. Drip
   b. Micro sprinklers

4. Sub Irrigation
   a. Underground emitters and tubing.
   b. Water table manipulation

C. Water Measurement

1. Water meters
   a. Propeller meter
   b. Electronic meter
   c. Magnetic meter

2. Velocity methods
   a. Float
   b. Pilot tube

3. Formed construction
   a. Flume
   b. Weir

D. Soil Moisture Measurement

1. Feel method
2. Sampling and drying
3. Electrical resistance blocks
4. Tensiometers
5. Portable probes
6. Neutron probes
7. Time domain reflectometry
8. Capacitance probe

E. Irrigation Scheduling

1. Plant requirements
   a. CIMIS
   b. Evapotranspiration
2. Soil capacity
3. Application rate and infiltration relationship

F. Pumping Systems

1. Terms and mathematical basics
2. Pump curves
3. Types of pumps
   a. Centrifugal
   b. Deep well turbine
   c. Submersible
   d. Propeller

G. System Evaluation

1. Determining uniformity
2. System improvement

2. **Required Lab Content:**

A. System Operation

1. System start-up
2. Volume measurement
3. Timing
4. Application rate

B. System Evaluation

1. Uniformity evaluation
2. Uniformity improvement
   a. system repairs and modification
   b. soil improvement
3. Application adjustment

C. System Maintenance

1. Sprinkler and emitter repair
2. Piping repairs
3. Filter maintenance

D. System Installation

1. Soil preparation and trenching
2. Piping installation
3. Riser and sprinkler/emitter installation
4. System start up and testing

3. **Recommended Content:**

A. System Installation

1. Equipment operation
   a. Backhoe
   b. Trencher

2. System Installation
   a. Filter setup
i. Concrete setup

b. Piping installation
c. Sprinkler or emitter

3. System Start-up

B. HOURS AND UNITS

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C. METHODS OF INSTRUCTION (TYPICAL)

Instructors of the course might conduct the course using the following method:

1. Subject matter will be presented through class lectures, field labs, and shop labs
2. Demonstration of operation of irrigation equipment
3. Instructor-led discussion and elaboration on appropriate conclusions regarding water use
4. Use of audio-visual materials
5. Guest speakers
6. Field trips

D. ASSIGNMENTS (TYPICAL)

1. EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS

   Time spent on coursework in addition to hours of instruction (lecture hours)

   A. Weekly lab report
   B. Given in class scenarios, students are required to develop an irrigation plan that meets the irrigation situation.
   C. Students will complete an irrigation project from design through installation.
   D. Weekly homework assignments that develop an understanding of the material taught during the lecture

2. EVIDENCE OF CRITICAL THINKING

   Assignments require the appropriate level of critical thinking

   A. Sample assignments:

   1. Develop irrigation schedules for a given situation, keeping in mind uniformity, crop needs, system type and application rates.
   2. I need to apply 2 inches of water using a furrow irrigation system with a DU of 86%. How
much water do I need to apply and how long should I run the 500 GPM pump in order to
apply the 2 inches over 10 acres?

3. Identify the following irrigation methods and provide two advantages and two disadvantages
   of each method.

4. Discuss all the factors that make up a water budget for the state of California.

E. TEXTS AND OTHER READINGS (TYPICAL)

1. Book: Dr. Charles M. Burt (2004). Ag-Irrigation Management (First/e). San Luis Obispo, CA Irrigation
   Training and Research Center.

III. DESIRED LEARNING

A. OBJECTIVES

1. Required Objectives
   Upon satisfactory completion of this course, the student will be able to:
   
   a. Identify irrigation system components and discuss their purposes and functions.
   b. Summarize the principles involved in the procurement, distribution, application, and
      management of water in agriculture.
   c. Explain why water conservation is important for agriculture and the environment.
   d. Demonstrate the ability to effectively setup an irrigation schedule in order to efficiently use water
      to meet specific crop needs.
   e. Identify various irrigation systems and be able to discuss advantages and disadvantages of each.
   f. Analyze a current irrigation system and make recommendations in order to improve irrigation
      efficiency.

2. Lab Objectives
   Upon satisfactory completion of the lab portion of this course, the student will be able to:
   
   a. Analyze various irrigation systems and make changes to improve irrigation efficiency.
   b. Measure irrigation flow and determine the amount of water applied.
   c. Identify various irrigation systems and discuss how their uses differ with crop type and location in
      the state.
   d. Analyze soil moisture content and develop an irrigation schedule to bring soil moisture back to
      field capacity.
   e. Develop a preventative maintenance schedule for irrigation components which include pumps,
      filters, valves, sprinklers and emitters.
   f. Analyze CIMIS data and develop a crop specific irrigation schedule.

3. Recommended Objectives
   Upon satisfactory completion of the course (when the related recommended content is covered) the student will
   be able to:
   
   a. Identify various irrigation equipment manufacturers and describe the products they provide.
IV. METHODS OF EVALUATION (TYPICAL)

A. FORMATIVE EVALUATION

1. Group discussion and project analysis using question and answer sessions
2. Laboratory reports
3. Irrigation design projects that meet industry standards
4. Irrigation system use and scheduling projects for various crops

B. SUMMATIVE EVALUATION

1. Midterm and final examinations
2. Completion of design and scheduling projects
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Course Learning Outcomes

Upon satisfactory completion of this course, the student should be prepared to:

1. Identify, evaluate, and recommend improvements for various irrigation methods.

2. Develop irrigation schedules for specific situations using crop evapotranspiration rates, soil moisture content, and irrigation method.