

Discipline: Agriculture	Sub-discipline: Environmental Horticulture
General Course Title: Landscape Irrigation	Min. Units: 3 Semester
Proposed Suffix: L	
<p>Course Description: Design, installation and maintenance of a water-efficient landscape irrigation system. Topics include water supply, basic hydraulics, component identification and terminology, system layout, pipe sizing; types of heads, valves, controllers, and practices related to appropriate horticulture for California. Laboratory required. (C-ID AG-EH 144L)</p>	
Required Prerequisites or Co-Requisites ¹	
Advisories/Recommended Preparation ²	
<p>Course Objectives: <i>At the conclusion of this course, the student should be able to:</i></p> <ul style="list-style-type: none"> • Describe regional and local water storage and delivery systems • Identify the percent of the state's developed water supply used for landscape irrigation • Describe how water moves through the soil. • Identify sprinkler irrigation system components on an irrigation plan • Define the basic concepts of water pressure, flow, velocity and friction loss • Calculate water pressure and flow at key points (meter, valves, worst head) in a landscape irrigation system • Describe the major types of sprinkler heads, valves and controller used in a landscape irrigation system • Space sprinkler heads for uniform application and specified precipitation rate on a landscape irrigation plan • Select and size pipe material based on use, water pressure, and flow for a irrigation plan. • Identify and select pipe fittings for the correct use in an irrigation plan • Specify heads, emitters, valves, backflow prevention and controller for a residential landscape plan. • Install PVC pipe, sprinkler heads, remote control valves, backflow prevention devices and controller for a landscape irrigation system. • Program a controller for water-efficient system operation for a given site. • Describe the need for pumping/filtering irrigation water from city mains and private wells • Perform a water audit on a spray or rotor system to determine efficiency of the system. • Apply the troubleshooting process to solve irrigation system problems of a given irrigation system. • Prepare and present a cost estimate for an irrigation system from a given irrigation plan. • Demonstrate professional work ethics and safety practices on the job site • Develop an efficient irrigation schedule for a given climate, landscape and irrigation system. • Design a landscape irrigation system from a given landscape or plot plan. • Explain the steps to installing a drip or micro spray system 	
<p>Course Content: 1. California's climate and water resources a. California's Mediterranean climate pattern</p> <p>Landscape Irrigation (Content Continued)</p>	

¹ Prerequisite or co-requisite course need to be validated at the CCC level in accordance with Title 5 regulations; co-requisites for CCCs are the linked courses that must be taken at the same time as the primary or target course.

² Advisories or recommended preparation will not require validation but are recommendations to be considered by the student prior to enrolling.

- b. Importance of winter rainfall and storage facilities
 - c. Regional and local water distribution systems
 - d. Statistics on landscape water use
2. Basic hydraulics and water movement through pipe
- a. Static pressure
 - b. Dynamic (operating) pressure
 - c. Flow (GPM)
 - d. Velocity
 - e. Friction loss
 - f. Calculation of water pressure and flow at key system points (meters, valves, worst heads)
3. Soil and plant water relations
- a. Soil types and drainage/aeration characteristics
 - b. Soil water holding capacity and rooting depth
 - c. Water use of plant types
 - d. Evapotranspiration concept and reference ET
 - e. Water movement and infiltration rates of soils
4. Water supply
- a. City mains and service lines
 - b. Wells, pumps and storage facilities
 - c. Water quality
 - d. Alternative water sources
 - e. Sprinkler irrigation system
 - f. Drip or micro-spray irrigation systems – surface & subsurface
5. Assembly methods and installation of system components
- a. Sprinkler heads, nozzles, and emitters
 - b. Manual and remote control valves
 - c. Backflow prevention devices
 - d. Pressure regulators and filters
 - e. Controllers and wiring
 - f. Moisture sensing devices
6. Pipe, hose / tubing, and fittings
- a. PVC pipe
 - b. Polyethylene pipe
 - c. Galvanized steel pipe
 - d. Copper pipe
 - e. Polyethylene hoses / tubing – drip units

**Landscape Irrigation
(Content Continued)**

7. System planning/layout, design, and installation

- a. Available water pressure and flow at point of connection
- b. Watering zones (hydrozones)
- c. Head selection and placement
- d. Precipitation rates and head spacing
- e. Circuiting heads into valve groups
- f. Location of valves, main lines and lateral lines
- g. Sizing valves and pipe
- g. Location of controller and sizing power and valve wires
- h. Controller programming and system operation check
- i. Design of landscape irrigation system
- j. Installation of landscape and drip irrigation systems – layout, trenching, component assembly, system check, adjustment, backfill

8 Estimating costs

- a. Irrigation plan reading and standard symbols
- b. Material take-off
- c. Supplier catalogs and price lists

9. Water-efficient system operation

- a. Water audit method of determining system efficiency
- b. Use of California Irrigation Management Information System (CIMIS) and other ET data resources
- c. Implementation of ET data in controller programming
- d. Troubleshooting problems
- e. Adjustments and repairs
- f. Local water agency assistance and resources
- g. Irrigation scheduling based on climate and type of system

10. Professional groups and activities

- a. California Landscape Contractors Association
- b. Irrigation Association Certification
- c. Certified Landscape Technician Irrigation exam
- d. PLANET (Professional Landcare Network)

Laboratory Activities: Individual Laboratory Activities are designed to support course objectives.

Methods of Evaluation: Lecture Comprehensive Quizzes and Exams Written Critical Thinking Scenarios Problem Analysis and Solution Research and Term Papers	Methods of Evaluation: Laboratory Laboratory Skill Validation by Observation Laboratory Projects and Reports Laboratory Research Projects and Reports Laboratory Skill Practicum Exams
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Typical Textbooks, Manuals, or Other Support Materials

[Irrigation 6E](#), Irrigation Association (2011)
[Principles of Irrigation 2E](#), Irrigation Association (2010)
 ALCA now PLANET [Landscape Training Manual for Irrigation Technicians](#). (2011) www.landcarenetwork.org (Available in Spanish) ISBN13: 978-0984021932

References:

Rochester, Eugene (1995) [Landscape Irrigation Design](#), American Society of Agricultural Engineers.
 Watkins, James A. (1994). [Turf Irrigation Manual](#). Telsco Industries, Dallas, TX. (ISBN:0-963509608)
 Keesen, Lary and Code, Cindy. (1995). [The Complete Irrigation Workbook Landscape Irrigation Training CD-Rom](#). Rain Bird Corp., Tucson, AZ
 California Landscape Contractor Association (1998). [California](#)

Landscape Standards. CLCA, Sacramento, CA.
 Shepersky, K., Ed. (1998). Landscape Irrigation Design and Specifications. Rain Bird Corp., Tucson, AZ
Landscape Irrigation Design Manual (Downloadable at: <http://www.rainbird.com/pdf/turf/IrrigationDesignManual.pdf>)
Irrigation System Design Manual. Hunter Industries. San Marcos, CA. (www.HunterIndustries.com)
Basic Irrigation Design Workbook. The Toro Company. Riverside, CA. (www.toro.com)
Irrigation Association Education Foundation website: <http://www.iaef.org/> (Available at this site are audit kits, lectures, lab modules, career information and downloadable photos for instructors)
Irrigation Association website has information on certification, books and other useful references: <http://www.irrigation.org>

Note: Many irrigation equipment manufacturers have design and product resources available. Contact your local dealer for availability. In addition, a great deal of product, design, and irrigation information can be obtained through The Center for Irrigation Technology, California State University, Fresno (<http://cati.csufresno.edu/cit/>)

Statewide Articulation: CPSLO-EHS 337, CPP-PLT 251/L, UCD ABT 165, other universities as lower division elective

FDRG Lead Signature:

Date:

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Internal Tracking Number