

**HORT 144 Course Outline as of Fall 2019****CATALOG INFORMATION**

Dept and Nbr: HORT 144 Title: LANDSCAPE IRRIGATION  
 Full Title: Landscape Irrigation  
 Last Reviewed: 1/22/2018

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	2.00	17.5	Lecture Scheduled	35.00
Minimum	3.00	Lab Scheduled	3.00	6	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	5.00		Contact Total	87.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 70.00

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade or P/NP

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly: HORT 92.1

**Catalog Description:**

Prepares students to design, install, maintain, and audit a water efficient landscape irrigation system. Topics include basic water supply, basic hydraulics, component identification and terminology, system layout, pipe sizing, and types of valves, heads, and controllers, and practices related to appropriate horticulture for California. Students who complete the course with a grade of "C" or better will be recognized as having completed an EPA (Environmental Protection Agency) approved WaterSense Training Program.

**Prerequisites/Corequisites:****Recommended Preparation:**

Eligibility for ENGL 100 or ESL 100 and CS 5 or proficiency in basic productivity software including word processing, spreadsheet, and presentation software

**Limits on Enrollment:****Schedule of Classes Information:**

Description: Prepares students to design, install, maintain, and audit a water efficient landscape irrigation system. Topics include basic water supply, basic hydraulics, component identification

and terminology, system layout, pipe sizing, and types of valves, heads, and controllers, and practices related to appropriate horticulture for California. Students who complete the course with a grade of "C" or better will be recognized as having completed an EPA (Environmental Protection Agency) approved WaterSense Training Program. (Grade or P/NP)

Prerequisites/Corequisites:

Recommended: Eligibility for ENGL 100 or ESL 100 and CS 5 or proficiency in basic productivity software including word processing, spreadsheet, and presentation software

Limits on Enrollment:

Transfer Credit:

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

<b>AS Degree:</b>	<b>Area</b>	Effective:	Inactive:
<b>CSU GE:</b>	<b>Transfer Area</b>	Effective:	Inactive:
<b>IGETC:</b>	<b>Transfer Area</b>	Effective:	Inactive:
<b>CSU Transfer:</b>		Effective:	Inactive:
<b>UC Transfer:</b>		Effective:	Inactive:

**CID:**

**Certificate/Major Applicable:**

Both Certificate and Major Applicable

## **COURSE CONTENT**

**Student Learning Outcomes:**

Upon completion of the course, students will be able to:

1. Select and size pipe material based on use, water pressure, and flow for a given irrigation plan.
2. Utilize formulas and calculation to determine irrigation rates, distribution, and uniformity.
3. Perform a water audit on a spray or rotor sprinkler system and determine the efficiency of the system.

**Objectives:**

Upon successful completion of this course the student will be able to:

1. Describe regional and local water storage and delivery systems
2. Identify the percent of the state's developed water supply used for landscape irrigation
3. Describe how water moves through the soil
4. Identify irrigation system components on an irrigation plan
5. Define the basic concepts of water pressure, flow, velocity and friction loss
6. Calculate water pressure and flow at key points (meter, valves, worst head) in a landscape irrigation system
7. Identify and describe the primary irrigation system components used in a typical landscape irrigation system
8. Space sprinkler heads and drip emitters for uniform application and specified precipitation rate
9. Select and size pipe material based on use, water pressure, and flow for an irrigation plan
10. Identify and select pipe fittings for the correct use in an irrigation plan

11. Specify heads, emitters, valves, backflow prevention and controller for a residential landscape plan
12. Install PVC pipe, polyethylene tube, drip emitters, sprinkler heads, remote control valves, pressure reducers, filters, backflow prevention devices and/or controllers for a landscape irrigation system
13. Program a controller for water-efficient system operation for a given site
14. Describe the need for pumping/filtering irrigation water from city mains and private wells
15. Perform a water audit on a spray or rotor system to determine efficiency of the system
16. Apply the troubleshooting process to solve irrigation system problems of a given irrigation system
17. Prepare and present a cost estimate for an irrigation system from a given irrigation plan
18. Demonstrate professional work ethics and safety practices on the job site
19. Develop an efficient irrigation schedule for a given climate, landscape and irrigation system
20. Design a landscape irrigation system from a given landscape or plot plan
21. Explain the steps to installing a drip or micro spray system
22. Describe common techniques utilized to retrofit a conventional system to low volume

### **Topics and Scope:**

- I. California's Climate and Water Resources
  - A. California's Mediterranean climate pattern
  - B. Importance of winter rainfall and storage facilities
  - C. Regional and local water distribution systems
  - D. Statistics on landscape water use
- II. Basic Hydraulics and Water Movement through Pipe
  - A. Static pressure
  - B. Dynamic (operating) pressure
  - C. Flow gallons per minute (GPM)
  - D. Velocity
  - E. Friction loss
  - F. Calculation of water forces at key system points
- III. 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 (ET) concept and reference ET
  - E. Infiltration rates of soils
- IV. Water Supply
  - A. City mains and service lines
  - B. Soil water holding capacity and rooting depth
  - C. Water quality
  - D. Alternative water sources
  - E. Sprinkler irrigation sources
  - F. Drip or micro-spray irrigation systems
    1. Surface
    2. Subsurface
- V. Assembly Methods and Installation of System Components
  - A. Sprinkler heads, nozzles, and drip emitters
  - B. Manual and remote control valves
  - C. Backflow prevention devices
  - D. Pressure regulators and filters
  - E. Controllers and wiring

- F. Moisture-sensing devices
- VI. Pipe, Hose / Tubing, and Fittings
  - A. PVC pipe
  - B. Polyethylene pipe
  - C. Galvanized steel pipe
  - D. Copper pipe
  - E. Polyethylene hoses / tubing
- VII. 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
  - H. Location of controller and sizing power and valve wires
  - I. Controller programming and system operation check
  - J. Design of landscape irrigation systems
  - K. Installation of landscape and drip irrigation systems - layout, trenching, component assembly, system check, adjustment, backfill
- VIII. Estimating Costs
  - A. Irrigation plan reading and standard symbols
  - B. Material take-off
  - C. Supplier catalogs and price lists
- IX. 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
  - H. Model water efficient landscape ordinance
- X. Professional Groups and Activities
  - A. California Landscape Contractor's Association
  - B. Irrigation Association Certification
  - C. Landscape Industry Certified Technician
  - D. National Association of Landscape Professionals (formerly PLANET)
  - E. QWEL (Qualified Water Efficient Landscaper)

All topics covered in lecture will also be covered in lab.

### **Assignment:**

#### Lecture-Related Assignments:

1. Weekly reading (10-20 pages) and homework
2. Cost estimate project: Prepare and present a detailed cost-estimate for a given irrigation system design
2. Quizzes (2 - 10), Midterm and Final Exam

#### Lab-Related Assignments:

1. Field trip and lab reports (2 - 12)
2. Irrigation installation project: may include Installation of PVC Pipe, sprinkler heads, remote control valves, drip irrigation, backflow prevention devices and/or controller for a landscape irrigation system
3. Controller programming: set a water-efficient irrigation schedule for a real or hypothetical landscape
4. Irrigation audit (1 - 2): Perform a water audit on a spray, rotor, and/or drip irrigation system to determine system efficiency
5. Irrigation design: Design and specify a landscape irrigation system for a given landscape or plan
6. Field trips required (1 - 4)

### Methods of Evaluation/Basis of Grade:

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Homework, Field trip and lab reports

Writing  
0 - 10%

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Controller programming, Irrigation audit, Cost estimate project

Problem solving  
20 - 40%

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Irrigation installation project, Irrigation design

Skill Demonstrations  
20 - 40%

**Exams:** All forms of formal testing, other than skill performance exams.

Quizzes, midterm, and final exam

Exams  
30 - 60%

**Other:** Includes any assessment tools that do not logically fit into the above categories.

Attendance and participation including field trips

Other Category  
0 - 20%

### Representative Textbooks and Materials:

Principles of Irrigation. 3rd ed. Irrigation Association. 2015

Irrigation. 6th ed. Irrigation Association. 2011 (classic)

Landscape Training Manual for Irrigation Technicians. 2nd ed. Professional Landcare Network. 2011 (classic)