

**CUYAMACA COLLEGE**  
**COURSE OUTLINE OF RECORD**

**ORNAMENTAL HORTICULTURE 235 – PRINCIPLES OF LANDSCAPE IRRIGATION**

4 hours lecture, 4 units

**Catalog Description**

Principles of hydraulics as applied to landscape irrigation systems, including static and dynamic pressures, pipe flows and velocities, pipe sizing, water hammer, pump selection and use. Introduction to system components including valves, backflow prevention devices, controllers and pumps and pipe.

**Prerequisite**

None

**Course Content**

- 1) Irrigation system anatomy
- 2) Hydraulic principles
  - a. Static pressure
  - b. Dynamic pressure
- 3) Use of technical charts
- 4) Determining design capacity
- 5) Landscape irrigation pipe sizing
  - a. Friction Factor method
  - b. Velocity Limit method
- 6) Sizing system components
- 7) Determining total system pressure requirement
- 8) Water hammer: estimation of potential and prevention
- 9) Cross connection control
- 10) Irrigation control valves: selection and use
- 11) Irrigation scheduling
- 12) Irrigation controllers: selection and use
- 13) Pump hydraulics
- 14) Pump performance curves
- 15) Pump selection
  - a. Centrifugal
  - b. Vertical turbine
  - c. Variable frequency drive
- 16) Pumps in series and parallel

**Course Objectives**

Students will be able to:

- 1) Calculate static and dynamic pressures in landscape irrigation systems.
- 2) Analyze irrigation systems to determine proper pipe sizing using the "Friction Factor" and "Velocity Limit" methods.
- 3) Compare and contrast various types of irrigation control valves, cross connection control devices, pumps, common irrigation pipe and fittings.
- 4) Calculate surge pressures due to water hammer; analyze the causes and determine corrective action.
- 5) Calculate the "Total Dynamic Head" necessary for a landscape irrigation system.
- 6) Calculate pressure losses due to friction, velocity and elevation change.

- 7) Calculate the design capacity and dynamic pressure at the design capacity for landscape irrigation systems using the design capacity and assumed flow methods.

### Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Quizzes and exams that measure students' ability to:
  - a. Analyze irrigation systems to determine proper pipe sizing using the "Friction Factor" and "Velocity Limit" methods.
  - b. Compare and contrast various types of irrigation control valves, cross connection control devices, pumps, common irrigation pipe and fittings.
  - c. Calculate surge pressures due to water hammer; analyze the causes and determine corrective action.
  - d. Calculate the "Total Dynamic Head" necessary for a landscape irrigation system.
  - e. Calculate the design capacity and dynamic pressure at the design capacity for landscape irrigation systems using the design capacity and assumed flow methods.
- 2) Exercises that measure students' ability to:
  - a. Calculate static and dynamic pressures in landscape irrigation systems.
  - b. Calculate pressure losses due to friction, velocity and elevation change.

### Special Materials Required of Student

Irrigation system components including control valves, controllers, cross connection control devices, irrigation pipe and fittings, pumps

### Minimum Instructional Facilities

Standard classroom with overhead/slide projectors

### Method of Instruction

Lecture and demonstration

### Out-of-Class Assignments

- 1) Reading assignments
- 2) Irrigation calculation assignments

### Texts and References

- 1) Required (representative examples):
  - a. Choate, Richard and James Watson. *Turf Irrigation Manual*. Telsco Industries, 1994. (current ed.)
  - b. Monroe, Brad. *Irrigation Hydraulics: Student Manual*. Hunter Industries, 1992. (current ed.)
- 2) Supplemental:
  - a. Irrigation Association. *Principles of Irrigation*. 3rd edition. Irrigation Association, 2015. ISBN: 978-1-935324-12-6
  - b. Monroe, ed. *The Handbook of Technical Irrigation Manual*. Hunter Industries, 1996. (current ed.)

### Exit Skills

Students having successfully completed this course exit with the following skills, competencies and/or knowledge.

- 1) Calculate static and dynamic pressures in landscape irrigation systems.
- 2) Analyze irrigation systems to determine proper pipe sizing using the "Friction Factor" and "Velocity Limit" methods.

- 3) Distinguish between various types of irrigation control valves, cross connection control devices, pumps, and common irrigation pipe and fitting.
- 4) Calculate surge pressures due to water hammer; analyze the causes and determine corrective action.
- 5) Estimate the required time necessary for irrigation and program a controller to satisfy the irrigation requirement.
- 6) Calculate the "Total Dynamic Head" necessary for a landscape irrigation system.
- 7) Evaluate irrigation pumping needs and determine the appropriate pump selection.
- 8) Calculate pressure losses due to friction, velocity and elevation change.
- 9) Calculate the design capacity and dynamic pressure at the design capacity for landscape irrigation systems.

### **Student Learning Outcomes**

Upon successful completion of this course, students will be able to:

- 1) Read water pressure and calculate pressure loss in landscape irrigation systems.
- 2) Determine the design capacity for landscape irrigation systems.
- 3) Identify standard landscape irrigation components.

(Note: the Irrigation Association updated their book in 2015, but the ISBN and edition number are the same as the 2013 ed.)