

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

ORNAMENTAL HORTICULTURE 238 – IRRIGATION SYSTEM DESIGN

2 hours lecture, 3 hours laboratory, 3 units

Catalog Description

Introduction to basic design and technical skills required to produce professional irrigation system designs. Building on the knowledge acquired in OH 235, students will design complete spray and low-volume systems, calculate hydraulic parameters and schedules, prepare details and specifications, practice presentation skills, analyze working designs, learn head spacing and pipeline layout, and specify equipment using manufacturers' catalogs. A design studio environment is used (including team building and mentoring exercises) to prepare students for entry-level employment in the irrigation design field.

Prerequisite

"C" grade or higher or "Pass" in OH 235 or equivalent" or concurrent enrollment

Entrance Skills

Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:

- 1) Calculate static and dynamic pressures in landscape irrigation systems.
- 2) Analyze irrigation systems to determine proper pipe sizing using both "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 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.

Course Content

- 1) Introduction to the design process
- 2) Drafting symbols and lines
- 3) Water conservation in design
- 4) Preparing a site plan
- 5) Plant materials, soils, wind, climate factors
- 6) Turf spray system design
- 7) Determining water supply and available pressure
- 8) Sizing meters, valves
- 9) Introduction to sprinkler layout
- 10) Design capacity worksheet
- 11) Turf and shrub area irrigation design
- 12) Head types, coverage, spacing
- 13) Precipitation rates and distribution uniformity
- 14) Valve placement and lateral circuits
- 15) Hydrozones and irrigation scheduling
- 16) Slope layout

- 17) Backflow prevention
- 18) Designing a rotor system on slope with backflow preventer
- 19) Pipe sizing, friction loss
- 20) Calculating total system pressure requirement
- 21) Pressure regulation
- 22) Controllers and wiring
- 23) Details, notes, legends and specifications
- 24) Measuring system uniformity
- 25) Introduction to low volume irrigation design
- 26) Designing with drip emitters in shrub areas
- 27) Pressure regulation and filtration for low volume emitters, microspray, in-line tubing
- 28) Residential front and back yard with spray and low volume systems
- 29) Calculating system runtime for low volume systems
- 30) Designing a commercial site with spray, rotor and low volume systems. Includes details, notes and specifications

Course Objectives

Students will be able to:

- 1) Compare and contrast various types of irrigation spray, rotary and impact heads to determine the most suitable choice for irrigation projects common to the landscape industry.
- 2) Produce irrigation plan sets for four projects to include turf, slopes, planters, median strips, isolated plantings, shrub beds and annual beds.
- 3) Compare and contrast various types of drip irrigation delivery devices including on-line emitters, in-line emitters, hose, tape and microspray devices to determine the most suitable choice for various irrigation projects.
- 4) Calculate the total system pressure requirement for a landscape irrigation project.
- 5) Calculate the minimum irrigation system design capacity for a landscape irrigation project.
- 6) Interpret landscape irrigation plans to determine the recommended system installation requirements and procedures.
- 7) Evaluate various installation options to determine the one that is most economically feasible and water conserving.

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. Determine the most suitable type of overhead spray head for irrigation projects common to the landscape industry.
 - b. Determine the most suitable types of drip irrigation delivery devices including on-line emitters, in-line emitters, hose, tape, and microspray devices to determine the one most suitable for various irrigation projects.
 - c. Calculate the total system pressure requirement for a landscape irrigation project.
 - d. Calculate the minimum irrigation system design capacity for a landscape irrigation project.
- 2) Exercises that measure students' ability to:
 - a. Prepare irrigation plan sets for common landscape areas.
 - b. Use irrigation plans to determine the recommended system installation requirements and procedures.
 - c. Determine the most economically feasible and water conserving irrigation design.

Special Materials Required of Student

Pen sets, manufacturer catalogs (donated by manufacturers)

Minimum Instructional Facilities

- 1) Classroom suitable for drafting with overhead/slide projectors
- 2) Blueprint machine

Method of Instruction

- 1) Lecture and demonstration
- 2) Group and individual laboratory activities
- 3) Assignments

Out-of-Class Assignments

Reading assignments

Texts and References

- 1) Required (representative examples):
 - a. Keesen, Larry. *The Complete Irrigation Workbook*. Create Space Independent Publishing Platform, 2013.

Student Learning Outcomes

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

- 1) Produce irrigation design sets for landscape areas using the proper types of irrigation systems (sprinkler or drip irrigation).
- 2) Calculate the total system pressure requirement for a landscape irrigation project.
- 3) Evaluate various installation options to determine which is the most economically feasible.