Lecture Contact Hours: 48-54; Homework Hours: 96-108; Total Student Learning Hours: 144-162

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

CENTER FOR WATER STUDIES 115 – WASTEWATER RECLAMATION AND REUSE

3 hours lecture, 3 units

Catalog Description
This course covers the fundamentals of wastewater reclamation and reuse. Topics include the history of wastewater treatment and reclamation; total resource recovery including bio-solids/biogas harvesting; planning, design, and construction of reclamation plants; and reclaimed wastewater distribution. Problems regarding regulations, marketing, and public perception of using reclaimed wastewater will be discussed, along with public safety issues.

Prerequisite
None

Course Content
1) **Wastewater Treatment**: Basics of wastewater treatment, history of water reclamation and how water reclamation has been used in California.
2) **Reclaimed Water Uses**: Case studies concerning irrigation uses for landscape and agriculture; groundwater recharging; industrial uses with cooling and process water; recreational landscape impoundments; building plumbing uses.
3) **Reclaimed Water Chemistry and Microbiology**: Basic reclaimed water chemistry; introduction to reclaimed water microbiology and water quality requirements.
4) **Planning and Design**: Planning and designing reclaimed water distribution systems; pressure and flow requirements, materials selection, system sizing and backflow protection.
5) **Marketing**: Identifying potential users, developer requirements and incentives for conversion to use reclaimed water.
6) **Operation and Maintenance**: Operation of wastewater reclamation plants; contingency plans and operation of reclaimed water distribution systems.
7) **On-Site Planning and Design**: Planning, design and retrofitting to use reclaimed water; backflow protection for dual use systems; color coding and signage on reclaimed piping.
8) **On-Site Operation and Maintenance**: Scheduling water use; controlling runoff and area overspray; backup water supplies; cross connection control and shut down tests of irrigation systems utilizing reclaimed water.
9) **Health and Safety Issues**: Microbiological risks of exposure to untreated sewage; risks with inadequately treated reclaimed water; chemical quality issues, blood borne pathogens, etc.

Course Objectives
Students will be able to:
1) Locate and identify wastewater reclamation treatment facilities and reclaimed water distribution systems in in San Diego County.
2) Cite primary regulations that govern Reclaimed water, Wastewater, and Potable Water Augmentation based on health and safety guidelines.
3) List key water quality differences between wastewater, reclaimed and potable waters based on health and safety guidelines.
4) Differentiate the components of beneficial reuse and resource recovery in the wastewater and reclamation fields of study.
5) List the multi-barrier processes in a Secondary treatment plant complying to CCR Title 22 Reclaimed Water regulations.

6) Describe the health and safety requirements of disinfection and log removal of pathogens in Wastewater Reclamation and Potable Water Augmentation.

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) Projects, writing assignments, and exams/quizzes which measure students' knowledge of reclaimed water treatment process, distribution systems, regulations, operation and maintenance, and health and safety issues.
2) Projects, writing assignments, and exams/quizzes which measure students' ability to identify reclaimed water issues regarding chemistry and microbiology, planning and design of facilities, marketing, regulatory agencies, and health and safety concerns.
3) Projects and assignments utilizing the Field Operations Skills Yard

Special Materials Required of Student
None

Minimum Instructional Facilities
Smart classroom

Method of Instruction
1) Lecture and discussion
2) Multimedia presentations
3) Guest speakers
4) Field trips
5) Demonstrations utilizing the Field Operations Skills Yard

Out-of-Class Assignments
1) Reading assignments
2) Writing assignments

Texts and References
1) Required (representative examples):
   a. Anisfeld, Shimon. *Water Resources*. Island Press, 2010.
   b. Conway et al. *Using Reclaimed Water to Augment Potable Water Resources*. American Water Works Association, 2008. ISBN-13 978-1572782501
   c. *Reclaimed Water*. Available for free at U.S. EPA website: http://www.epa.gov/watersense/pubs/guide.html
2) Supplemental: None

Student Learning Outcomes
Upon successful completion of this course, students will be able to:
1) Explain the process of total resource recovery and beneficial reuse as it relates to wastewater reclamation and potable water augmentation.
2) List the multi-barrier processes of a Wastewater Recovery Treatment system using Primary, Secondary, Advanced Tertiary, and indirect potable reuse.
3) Describe how installation of reclaimed wastewater facilities and residential grey water recovery systems can reduce water and wastewater flows.
4) Explain the primary regulations that govern reclaimed water uses in San Diego County based on health and safety guidelines.