CE 451 Water Resources Engineering 3 Units

USC | SONNY ASTANI DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

ABET Course Syllabus

Course Information, Textbook and Supplementary Materials

Course Description: Discussion of broad perspectives on control and utilization of water, quantitative hydrology, ground water, probability concept, economic study, hydraulic structures, multi-purpose water resources projects.

Required: BSCE BS **Elective:** All other CE / ENE programs

Prerequisites: CE 309 Fluid Mechanics –or– ENE 410 Environmental Fluid Mechanics

Co-Requisites: None

Required Textbook: Water Resources Sustainability, by Larry Mays (2007), McGraw Hill Book co.

Reference: Water Resources Eng., 4th edition (1992) by Linsley, Franzini, Freyberg, Tchobanoglous, McGraw Hill Book Co.

Topics Covered	Learning Outcomes
Review of fluid mechanics and general discussion of water resources eng. ▪ Groundwater hydraulics and hydrology of groundwater flow ▪ Hydrology - descriptive and quantitative hydrology methods for hydrological analysis ▪ Probability concepts in water resources engineering ▪ Probability distribution function, stochastic hydrology ▪ Economical analysis for water resources system ▪ Flood control problems	Students will understand the topics and their attendant problems and risks, as follows: 1. General classification of problems in water resources engineering 2. Hydrologic cycles, rainfall, runoff, evaporation & transpiration 3. Quantitative hydrology. hydrograph analysis, rainfall-runoff relation 4. Unit hydrograph, rational formula, flood routing, river routing 5. Ground water hydrology, well hydraulics, aquifer characteristics 6. Probability concepts in water resources planning – extreme events 7. Reservoir Engineering – storage, yield, sediments control, wind waves, reservoir oscillations 8. Dam types, analysis and design criteria, adv./disadvantages of earth/concrete dams, environmental issues 9. Spillways, gates and outlet works, energy dissipater, scour control 10. Analyze flow in open channels, hydraulic jumps, critical and subcritical flows 11. Water related issues worldwide - floods, landslides, tsunamis 12. Describe issues involved faced in hydrological cycles, precipitation, runoffs, and floods. 13. Perform groundwater well hydraulics analysis.
▪ Reservoirs, dams, spillways, gates and outlet works ▪ Analysis and design of open channels ▪ Analysis and design of pressure conduit systems ▪ Hydraulic machinery and hydroelectric power	14. Determine the capacity needed in reservoir design, safe water yield, sediment control 15. Design dams, hydraulic jumps, energy dissipaters

Topics Covered	Learning Outcomes
▪ Examples of problems combining hydrology, risk, hydraulic engineering and engineering economic analysis	16. Understand uncertainty in water resources projects worldwide

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Lecture and Lab Schedule			
Lecture		**Lab**	
Sessions per Week	Duration per Session	Sessions per Week	Duration per Session
2	1.5 hours	1	1.5 hours

Relation of Course Objectives to Program Outcomes

The Civil Engineering program is designed to teach beyond the technical content of the curriculum and prepare the students to utilize what they learn in a professional setting.

This course contributes to the program outcomes as outlined in the adjacent table.

Course Contribution to Program Outcomes (a-k)	✓ Key
a. An ability to apply knowledge of mathematics, science, and engineering.	
e. An ability to identify, formulate and solve engineering problems.	✓
h. The broad education necessary to understand the impact of engineering solutions in a global economic and environmental and societal context.	

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