CE 451 WATER RESOURCES ENGINEERING

Catalog data: CE 451, Water Resources Engineering, 4 units.
Discussion of broad perspectives on control and utilization of water resources. Hydrology, probability concept, economic study, hydraulic structures, multiple purpose water resources projects. Prerequisite: CE 309.

Textbook: "Water Resources Engineering" by Linsley, Franzini, etc. McGraw-Hill

Instructor: J.J. Lee, Professor of Civil & Environmental Engineering

Goals: To provide seniors and first year graduate students in Civil/Environmental Engineering broad perspectives on the principles and engineering practices of water resources engineering.

Prerequisites by topic: Engineering Fluid Mechanics

1. Fluid statics.
2. Basic fluid mechanics principles on conservation of mass, momentum and energy.
3. Basic concepts on real fluid effects, flow resistance.

Course topics:

1. Review of fluid mechanics and general discussion of water resources engineering (3 hours).
2. Hydrology - descriptive and quantitative hydrology methods for hydrological analysis (12 hours).
3. Ground water - hydraulics and hydrology of ground water flow (6 hours).
4. Probability concepts in water resources engineering. Probability distribution function, stochastic hydrology (6 hours).
5. Reservoirs, dams, spillways, gates and outlet works (8 hours).
6. Analysis and design of open channels (4 hours).
7. Analysis and design of pressure conduit systems (4 hours).
8. Hydraulic machinery and hydroelectric power (3 hours).
9. Economical analysis for water resources system (3 hours).
10. Flood control problems (3 hours).
11. Examples of problems combining hydrology, risk, hydraulic engineering and engineering economic analysis (2 hours).

Grading policy

1. Two mid-tern examination, close book (40%)
2. One final examination, open and close book (40%)
3. Home work (15%)
4. Rainfall records, 3 stations, continuous throughout the semester (5%)

Problems of water-resources engineering

Studies and facilities required	Control of excess water				Conservation (quantity)				Conservation (quality)
	Flood mitigation	Storm drainage	Bridges, culverts	Sewerage	Water supply	Irrigation	Hydro power	Navigation	Pollution control
How much water is needed?	—	—	—	—	×	×	×	×	×
How much water* can be expected?									
Minimum flow*	—	—	—	×	×	×	×	×	×
Annual yield*	—	—	—	×	×	×	×	×	×
Flood peaks	×	×	×	—	×	×	×	×	
Flood volume	×	×	—	—	—	—	—	—	×
Groundwater*	—	×	—	×	×	×	—	—	×
Who may use the water?	—	—	—	—	×	×	×	×	×
What kind of water is it?									
Chemical	—	×	—	×	×	×	—	—	×
Bacteriological	—	×	—	×	×	×	—	—	×
Sediment	×	×	×	×	×	×	×	×	×
What structural problems exist?									
Geology	×	×	×	×	×	×	×	×	×
Dams	×	—	—	—	×	×	×	×	×
Spillways	×	—	—	—	×	×	×	×	×
Gates	×	×	—	×	×	×	×	×	×
Sluiceways	×	—	—	—	×	×	×	×	
Intakes	—	—	—	—	×	×	×		
Channel works	×	×	×	×	—	—	—	×	
Levees	×	×	×						
Pipelines	—	×	—	×	×	×	×	—	×
Canals	×	×	—	—	×	×	×	×	
Locks	—	—	—	—	—	—	—	×	
Pumps	×	×	—	×	×	×	×	×	×
Turbines	—	—	—	—	—	—	×		
Purification	—	×	—	×	×	×	—	—	×
Does project affect wild life or natural beauty?	×	×	×	×	×	×	×	×	×
Is the project economic?	×	×	×	×	×	×	×	×	×

* Available water must be expressed in terms of the probability that it will be available in any year.