

# CE378 | WATER RESOURCES ENGINEERING (4-0)4

Fall 2018-2019

**Course Instructors:** 01: Dr. Nuri Merzi (K4-107 / merzi@metu.edu.tr)

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**Web site:** <http://courses.ce.metu.edu.tr/ce378/>

**Catalog description:** Introduction to hydrology and water resources engineering. Basin and hydrologic processes: precipitation, streamflow, infiltration. Hydrograph analysis. Hydrologic flood routing. Groundwater hydrology. Dams and spillways. Municipal water supply systems. Wastewater and stormwater collection and removal. Irrigation and drainage. *Pre-requisite: CE 372*

## **COURSE OUTLINE**

### **1 Introduction (2 hrs.)**

- Scope of the course
- Introduction to Water Resources Engineering
- Hydrologic cycle and system concept

### **2 Hydrologic Processes (8 hrs.)**

- Basin
- Precipitation
- Stream flow
- Infiltration

### **3 Hydrograph Analysis (9 hrs.)**

- Components of runoff
- Hydrograph characteristics
- Unit hydrograph theory
- Synthetic unit hydrograph

### **4 Reservoir Routing (2 hrs.)**

- Introductory remarks
- Routing in reservoirs

### **5 Dams and Spillways (15 hrs.)**

- Classification and parts of dams
- Dam construction principles
- Concrete gravity dams
- Arch dams
- Spillway design flow
- Hydraulics of overflow spillways
- Crest gates and spillway profile
- Energy dissipation facilities

### **6 Groundwater Hydrology (8 hrs.)**

- Fundamentals of groundwater flow
- Groundwater flow equations
- Well hydraulics

### **7 Water Supply (5 hrs.)**

- Municipal water requirements and population estimation
- Characteristics of municipal water supply systems
- Hydraulics and operation of gravity pipelines
- Design of gravity transmission lines

### **8 Wastewater and Storm Water Collection and Removal (3 hrs.)**

- Flow in sewers
- Design of storm sewer systems

- Design of sanitary sewer systems

### 9 Irrigation and Drainage (2 hrs.)

- Introduction, land classification
- Characteristics of irrigation systems
- Design of classical irrigation systems by Demand Method
- Land drainage facilities

#### **TEXT BOOKS**

1. Usul, N. 2013. Engineering Hydrology, 3<sup>rd</sup> Edition, METU Press, Ankara
2. Yanmaz, A.M. 2013. Applied Water Resources Engineering, 4<sup>th</sup> Edition, METU Press, Ankara

#### **SUGGESTED REFERENCES**

1. Chow, V.T., Maidment, D.R., and Mays, L.W., 1988. Applied Hydrology, McGraw Hill.
2. Hansen, V.E., Israelsen, O.W., and Stringham, G.E., 1980. Irrigation Principles and Practices, John Wiley and Sons, New York
3. Linsley, R.K., Kohler, M. A., and Paulhus, J.Lh. 1988. Hydrology for Engineers, Mc Graw Hill.
4. Linsley, R.K., Franzini, J., Freyberg, D., and Tchobanoglous, G. 1992. Water Resources Engineering, Mc Graw Hill
5. Jansen, R.B., 1988. Advanced Dam Engineering, Van Nostrand Reinhold, New York.
6. Luthin, J.N., 1966. "Drainage Engineering", John Wiley and Sons, New York.
7. Mc Ghee, T. J., 1991. Water Supply and Sewerage, Mc Graw Hill, Singapore.
8. Robertson, J. A., Cassidy, J. J., and Chaudry, M. H. 1988. Hydraulic Engin., Houghton Miffling Comp.
9. Shaw, E.M., 1991. Hydrology in Practice, Chapman and Hall.
10. Tworth, A.J., Law, F.M., Crowley, F.W., and Ratnayaka; D.D., 1994. Water Supply, Edward Arnold.
11. USBR, 1987. Design of Small Dams, Water Resources Publications.

#### **GRADING**

- (25%) Midterm exam 1  
 (25%) Midterm exam 2  
 (35%) Final exam  
 (15%) Quiz

***(Exam places will be announced later.)***

#### **NOTES**

1. NA (Not Attended) grade will be given to those students who have
  - not taken at least 50% of the quizzes
  - not taken midterm exams without official medical report, or
  - taken very low grades from midterm exams, i.e. less than 20/100 (average of 2 exams)
 These students will be announced in the course web page before the final exam and they **will NOT be allowed** to take the final exam. Therefore, **ATTENDANCE IS STRICTLY SUGGESTED.**
2. Two recitations will be held. Attending one of the recitation sessions will be enough since the same questions will be solved in both. **Recitation classrooms will be announced later on the course web page.**
3. All the lecture notes will be posted on [www.odtuclass.metu.edu.tr](http://www.odtuclass.metu.edu.tr). Course related announcements will be posted on the course web site. Please check both web sites regularly.
4. Those chapters and parts of the text books, which are included in CE378, are given in the course web page.