

College of Engineering

Department of Civil Engineering

جامعة  
الملك سعود  
King Saud University



## CE 423 Hydraulic Structures

Credit and  
Contact hours

3 / 3 (Lectures), 1 (Tutorials), 0 (Laboratory)

Required, or  
Elective

Elective for a BSCE degree

Course  
Description

Design of inlet structures of irrigation canals, cross structures, culverts, siphons and aqueducts, energy dissipation below hydraulic structures, spillways, and design of dams.

Prerequisites  
or Co-  
requisites

CE324 (Hydraulics), Prerequisite by Topics:  
1. Open channel hydraulics including uniform and non uniform flow.  
2. Pipe flow and its characteristics.  
3. Hydraulics of different flow measurements device such as sharp and broad crested weirs.  
4. Fluid hydrostatics.

Course  
Learning  
Outcomes

Students completing this course successfully will be able to

| Course Learning Outcomes  | Related Student Outcomes (SO) |
|---|-------------------------------|
| CLO1. Determine the most appropriate hydraulic structures that is suitable for a specific problem | SO1                           |
| CLO2. Design, analyze and proof that the hydraulic structure is safe and economic.                | SO2                           |
| CLO3. Demonstrate broaden skills in team work, communication and planning through small projects  | SO5                           |

Student  
Outcomes  
related to this  
Course

SO1. an ability to **identify, formulate, and solve** complex engineering problems by applying principles of engineering, science, and mathematics, and using **modern engineering tools** [ ABET 1]  
SO 2. an ability to apply **engineering design** to produce solutions that meet specified needs with consideration of **public health, safety, and welfare**, as well as **global, cultural, social, environmental, and economic factors**. [ABET 2]

|  |   |               |
|--|---|---------------|
|  | <b>SO 5.</b> an ability to function effectively on a <b>team</b> whose members together provide <b>leadership</b> , create a <b>collaborative</b> and <b>inclusive environment</b> , <b>establish goals</b> , <b>plan tasks</b> , and <b>meet objectives</b> . [ABET 5]   |               |
| <b>Topics Covered</b>                          | <b>List of Topics</b>   |               |
|  | 1. Introduction, Importance of hydraulic structure<br>Classification of hydraulic structure according to use.   | CLO1          |
|  | 2. Dams, Historical review, Type of dams, Selection of type of dam, Forces acting on dam, Gravity dams, Arch dams.  | CLO1          |
|  | 3. Spillways, General types of spillways, Ogee type spillway.   | CLO2 and CLO3 |
|  | 4. Energy Dissipation, Energy dissipation on spillways, Hydraulic jump energy dissipation.  | CLO2 and CLO3 |
|  | 5. Regulators, Channel diversion, Head regulator, Cross regulator.  | CLO2 and CLO3 |
|  | 6. Cross structures, Aqueducts and transitions, Culverts, Bridges.  | CLO2 and CLO3 |
|  | 7. Other Structures, Flow measurement structures, Gates, Valves.  | CLO2 and CLO3 |
| <b>Textbook(s) and Other Required Material</b> | <ol style="list-style-type: none"> <li>1. Novak, P., Moffat, A. Nalluri, C. and Narayanan, R., Hydraulic Structures, 3ed Ed., 2001.</li> <li>2. Varshney, R., Gupta, S. and Gupta, R., Theory and Design of Irrigation Structures, 1982.</li> <li>3. Ray, K., et al, Water Resources Engineering, McGraw-Hill, 1992.</li> <li>4. U.S. Bureau of Reclamation, Design of Small Dams, U.S. Government Office, 1987.</li> <li>5. Santosh Kumar Garg, Irrigation Engineering and Hydraulic Structures, Delhi, 2002.</li> </ol> |               |
| <b>Grading System</b>                          | Quizzes and Home Works  | 10%           |
|  | Mid-term exams  | 20%           |
|  | Group project oral test   | 10%           |
|  | Final Exam  | 40%           |
| <b>Instructors</b>                             | Dr. Ibrahim Elsebaie (2A81), email; elsbaie@ksu.edu.sa  |               |
| <b>Date of Review</b>                          | September 2020  |               |