

**King Saud University
College of Engineering
Civil Engineering Department**

CE423 Hydraulic Structures

Course Description

CE423 Hydraulic Structures 3(3,1,0)

Design of inlet and outlet structures for irrigation canals. Cross structures, culverts, siphons and aqueducts. Energy dissipation below hydraulic structures. Spillways. Design of dams.

Prerequisite

CE322 Hydraulics 4 (3, 0, 2)

Textbook (s) and / other Required Material

- Novak, P., Moffat, A. Nalluri, C. and Narayanan, R., *Hydraulic Structures*, 3^{ed} Ed., 2001.
- Varshney, R., Gupta, S. and Gupta, R., *Theory and Design of Irrigation Structures*, 1982.
- Ray, K., et al, *Water Resources Engineering*, McGraw-Hill, 1992.
- U.S. Bureau of Reclamation, *Design of Small Dams*, U.S. Government Office, 1987.
- Peterka, A., *Hydraulic Design of Stilling Basins and Energy Dissipators*, Engineering Monograph No. 25, Bureau of Reclamation, 1978.

Course Topics

1. Introduction, Importance of HS, Classification of HS according to use.
2. Dams, Historical review, Type of dams, Selection of type of dam, Forces acting on dam, Gravity dams, Arch dams.
3. Spillways, General, Types of spillways, Ogee type spillway.
4. Energy Dissipation, Energy dissipation on spillways, Hydraulic jump energy dissipation.
5. Regulators, Channel diversion, Head regulator, Cross regulator.
6. Cross structures, Aqueducts and transitions, Culverts, Bridges.
7. Other Structures, Flow measurement structures, Gates, Valves.

Course Objectives

The main objectives of this course are:-

- 1- use the knowledge and skills studied previously, especially, on fluid mechanics, hydraulics and hydrology into this course.
- 2- to recognise the different types of hydraulic structures, to understand its purpose and function and to select the most appropriate structure and location for a specific problem.
- 3- to design, to analyse and to proof that the hydraulic structure is save and economical.
- 4- to broaden skills in team work, communication and planning through small projects.

Course Outcomes

Students successful on this course will :-

- 1- Use and integrate the fundamental and basics studied towards the goal of selecting, analysing and designing of hydraulic structures.
- 2- Cope with decision making and satisfy competing objectives.

- 3- Design, analyse and proof that the hydraulic structure is save and economical.
- 4- Work in a team and learn successful group interaction for a project.
- 5- Deliver an oral presentation for the project.

Contribution of course to meet the professional component

College-level mathematics and basic Science: 0 credit

Engineering topics: 3 credits

General education: 0 credits

Class / Laboratory Schedule

Three 50-minute lectures session and one 50-minute numerical session per week.

Relationship of Course to ABET and Program Outcomes

This course will enhance the student's

- 1- ability to apply knowledge of mathematics, science, and engineering **[ABET a]**.
- 2- ability to identify, formulate, and solve engineering problems **[ABET e]**. This includes the ability to evaluate and synthesize information and develop alternative solutions.
- 3- ability to design a system, component, or process to meet desired needs **[ABET c]**.
- 4- ability to perform civil engineering design by means of design experiences integrated throughout the curriculum.
- 5- ability to communicate effectively **[ABET g]**.
- 6- ability to articulate professional ideas clearly and precisely, prepare written materials and make oral and written presentations.
- 7- Understanding Civil Engineering practice in procurement of work, bidding, professional interactions and importance of professional licensing in construction.
- 8- understanding of professional and ethical responsibility **[ABET f]**. Ensuring the occupational and public safety and for constructing work in a professional and ethical manner.
- 9- knowledge of contemporary issues **[ABET j]**.
- 10- understanding the impact of engineering solutions in a global and societal context **[ABET h]**.
- 11- ability to pass the FE examination

Assessment Tools

Course outcomes are assessed using grades on:-

- Homework Assignments
- Midterm exams
- Final exam
- Oral presentation of small project for tow or three students.