

<b>CE 423</b> <b>Hydraulic Structures (HS)</b>	
<b>Department of Civil Engineering</b> <b>King Saud University</b>	
<b>Course Description:</b> <b>CE 423: Hydraulic Structures</b> (Required for a BSCE degree)	Design of inlet and outlet structures for irrigation canals. Cross structures, culverts, siphons and aqueducts. Energy dissipation below hydraulic structures. Spillways. Design of dams. 3 (3,1,0)
<b>Prerequisite</b>	CE324 Hydraulics 2 (2, 1,0)  Topics: <ol style="list-style-type: none"> <li>1. Open channel hydraulics including uniform and non uniform flow.</li> <li>2. Pipe flow and its characteristics.</li> <li>3. Hydraulics of different flow measurements device such as sharp and broad crested weirs.</li> <li>4. Fluid hydrostatics.</li> </ol>
<b>Course learning Outcomes</b>	Students completing this course successfully will be able to: <ol style="list-style-type: none"> <li>1. Use the knowledge and skills studied previously, especially, on fluid mechanics, hydraulics and hydrology into this course.</li> <li>2. Recognise the different types of hydraulic structures, to identify its purpose and function and to choose the most appropriate structure and location for a specific problem.</li> <li>3. Design, analyze and proof that the hydraulic structure is safe and economic.</li> <li>4. Demonstrate broaden skills in team work, communication and planning through small projects.</li> </ol>
<b>Topics Covered</b>	<ol style="list-style-type: none"> <li>1. Introduction, Importance of HS, Classification of HS according to use.</li> <li>2. Dams, Historical review, Type of dams, Selection of type of dam, Forces acting on dam, Gravity dams, Arch dams.</li> <li>3. Spillways, General, Types of spillways, Ogee type spillway.</li> <li>4. Energy Dissipation, Energy dissipations on spillways, Hydraulic jump energy dissipation.</li> <li>5. Regulators, Channel diversion, Head regulator, Cross regulator.</li> <li>6. Cross structures, Aqueducts and transitions, Culverts, Bridges.</li> <li>7. Other Structures, Flow measurement structures, Gates, Valves.</li> </ol>
<b>Class/ tutorial Schedule</b>	Three 50-minute lectures session and one 50-minute numerical session per week.
<b>Project</b>	A project for collecting information about an existing or under constructed hydraulic structure in the Kingdom or outside. This will link the student with real structures and expose them to more detail information uncovered in the classes. A written report and oral presentation is required.
<b>Contribution of Course to Meeting the Professional Component</b>	<ol style="list-style-type: none"> <li>1. Students learn the analysis process to be involved in designing various structural components used in professional structural engineering.</li> <li>2. Students improve their writing, communication and presentation skills.</li> <li>3. Students recognize the role of professional societies in developing codes and standards and updating current knowledge.</li> </ol>
<b>Relationship of Course to</b>	Course outcomes are:-

<b>Program Outcomes</b>	<ol style="list-style-type: none"> <li>1. An ability to apply knowledge of mathematics, science, and engineering.</li> <li>2. An ability to design a system, component, or process to meet desired needs with realistic constraints.</li> <li>3. An ability to identify, formulate, and solve engineering problems.</li> <li>4. An ability to articulate professional ideas clearly and precisely, prepare written materials, and make oral and written presentations.</li> </ol>
<b>Textbook(s)</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>