

CE 501 Design of Hydraulic Structures

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)												
Required, or Elective	Elective												
Course Description	Recognize different types of hydraulic structures and its importance. Design concrete gravity dams, spillways, dam outlet and energy dissipation structures. The course includes also design cross drainage works, canals, drains, culverts, head works, outlet works, regulators, falls, canal transitions, and flood control structures.												
Prerequisites or Co-requisites	None												
Course Learning Outcomes	<p>Students completing this course successfully will be able to:</p> <table> <thead> <tr> <th>Course Learning Outcomes (CLOs)</th><th>Related Student Outcomes (SO)</th></tr> </thead> <tbody> <tr> <td>CLO1. Recognize the importance and the different types of hydraulic structures, to identify its purpose and function. K1</td><td>SO1</td></tr> <tr> <td>CLO2. Develop the hydraulic and hydrology data and design criteria required for designing the hydraulic structures. S1</td><td>SO2</td></tr> <tr> <td>CLO3. Investigate and analyze different hydraulic structures; for example: dams, spillways, stilling basins, culverts, and storm drainage structures. S2</td><td>SO3</td></tr> <tr> <td>CLO4. Design different hydraulic structures; for example: concrete gravity dams, Earth dams, spillways, stilling basins, culverts manually and using computer programs. S4</td><td>SO5</td></tr> <tr> <td>CLO5. Effectively manage work plans and assigned projects in performing the methodology used, analyzing the required design data and presenting the projects results. V2</td><td>SO7</td></tr> </tbody> </table>	Course Learning Outcomes (CLOs)	Related Student Outcomes (SO)	CLO1. Recognize the importance and the different types of hydraulic structures, to identify its purpose and function. K1	SO1	CLO2. Develop the hydraulic and hydrology data and design criteria required for designing the hydraulic structures. S1	SO2	CLO3. Investigate and analyze different hydraulic structures; for example: dams, spillways, stilling basins, culverts, and storm drainage structures. S2	SO3	CLO4. Design different hydraulic structures; for example: concrete gravity dams, Earth dams, spillways, stilling basins, culverts manually and using computer programs. S4	SO5	CLO5. Effectively manage work plans and assigned projects in performing the methodology used, analyzing the required design data and presenting the projects results. V2	SO7
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Student Outcomes related to this Course	<p>SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems.</p> <p>SO 2 Provide solutions for complex and real-life engineering problems through critical thinking and the use of modern engineering tools, and identify their impact on social, global, cultural, environmental, safety, and economic factors.</p> <p>SO 3 Investigate scientific research problems independently or through teamwork using critical thinking, appropriate techniques, advanced tools, and management principles.</p> <p>SO 5 Design novel advanced Civil Engineering systems and evaluate their performance, sustainability, and effectiveness for engineering practice and their impact in global, economic, environmental, and societal contexts</p> <p>SO 7 Effectively manage, individually or in groups, specialized tasks and activities in coursework, projects, assignments, and research work with a high level of autonomy and responsibility.</p>												

Topics Covered	List of Topics		Related CLOs
	1. Introduction to the importance of the hydraulic structures in water resources planning and management.		CLO 1,2
	2. Understand and recognize the different types of Dams.		CLO 1,2,3
	3. Design Procedures, Codes and Standards		CLO 2,3,4
	4. Analysis and designs for concrete gravity dams and Earth dams.		CLO 2,3,4
	5. Design of spillways and stilling basins		CLO 4
	6. Design of crossing structures and culverts (different cross sections)		CLO 4
	7. Use of computer programs to analyze and design Culvert		CLO 2,3,4
	8. Use of computer programs to analyze and design concrete gravity dams		CLO 4,5
	9. Use of computer programs to analyze and design Earth dams		CLO 4,5
Textbook(s) and Other Required Material	<ul style="list-style-type: none"> Hydraulic structures, 4th Edition: P. Novak, A.I.B. Moffat, C. Nalluri and R. Narayanan, Taylor and Francis Group, ISBN:9780415386265 Theory and Design of Irrigation Structures Vol. II , Latest Ed, R. S. Varshney et al 		
Grading System	Assignments and Quizzes	15%	
	Lecture attendance	--	
	Seminar presentation	5%	
	Overview (literature review) paper	5%	
	Project - report and oral presentation	10%	
	Mid-term exam	25%	
	Final Exam	40%	
Instructors	Dr. Ibrahim Elsebaie		
Date of Review	March, 2025		