

College of Engineering

Department of Civil Engineering

جامعة  
الملك سعود  
King Saud University



## CE 451 Advanced Water and Wastewater Treatment

<b>Credit and Contact hours</b>	3 / 3 (Lectures), 1 (Tutorials), 0 (Laboratory)	
<b>Required, or Elective</b>	Elective for a BSCE degree	
<b>Course Description</b>	<p>The course will teach the role of water and wastewater treatment technologies in providing adequate water supply and effective sanitation that are essential for a human. This course will detail urban water services, focusing on basic drinking water technologies. Unit processes involved in the treatment chain will be described and designed as well as the physical and chemical processes involved. There will be an emphasis on water quality and the functionality of each unit process within the treatment chain. Also, unit processes involved in the wastewater treatment will be described and designed as well as the physical, chemical and biological processes involved.</p>	
<b>Prerequisites or Co-requisites</b>	CE 448 (Water and Wastewater Treatment)	
<b>Course Learning Outcomes</b>	Students completing this course successfully will be able to	
	<b>Course Learning Outcomes</b>	<i>Related Student Outcomes (SO)</i>
	<b>CLO1.</b> Identify the characteristics of water and wastewater as well as its quality parameters to design water and wastewater treatment systems	<b>SO1</b>
	<b>CLO2.</b> Identify water pollution control objectives and potable water and wastewater treatment processes to design water and wastewater treatment systems	<b>SO1</b>
	<b>CLO3.</b> Design advanced treatment processes in water/wastewater plant to meet the required specifications and considering public health, environmental and economic factors	<b>SO2</b>
<b>CLO4.</b> Acquire the new technologies related to water and wastewater treatments and its applications in real engineering projects (research project)	<b>SO7</b>	
<b>Student Outcomes related to this Course</b>	<p><b>SO 1.</b> an ability to <b>identify, formulate, and solve complex engineering</b> problems by applying principles of engineering, science, and mathematics, and using <b>modern engineering tools.</b> [ ABET 1].</p>	

	<p><b>SO 2.</b> an ability to apply <b>engineering design</b> to produce solutions that meet specified needs with consideration of <b>public health, safety, and welfare</b>, as well as <b>global, cultural, social, environmental, and economic factors</b>. [ABET 2]</p> <p><b>SO 7.</b> an ability to <b>acquire</b> and <b>apply new knowledge</b> as needed, using <b>appropriate learning strategies</b>. [ABET 7]</p>	
<b>Topics Covered</b>	<b>List of Topics</b>	<b>Related CLOs</b>
	1. Characteristics of water: physical, chemical and biological parameters	CLO 1
	2. Prediction of water demand and wastewater generation, water and wastewater quality	CLO 1
	3. Introduction to drinking water treatment	CLO 2
	4. Groundwater treatment (aeration, coagulation, flocculation, sedimentation, filtration, adsorption, reverse osmosis, and disinfection)	CLO3
	5. Surface water treatment (coagulation, flocculation, sedimentation, filtration, adsorption, and disinfection)	CLO3
	6. Introduction to wastewater treatment	CLO 2
	7. Primary wastewater treatment system	CLO3
	8. Biological wastewater treatment	CLO3
	9. Activated sludge process, nitrogen and phosphorus removal	CLO3
	10. Lagoons and natural wastewater treatment systems	CLO3
	11. Sludge treatment and disposal	CLO3
	12. Research project	CLO 4
<b>Textbook(s) and Other Required Material</b>	<ol style="list-style-type: none"> <li>1. Metcalf &amp; Eddy, Inc. "Wastewater Engineering: Treatment and Resource Recovery Water Reuse: Issues, Technology and Applications", 5th edition, McGraw-Hill Inc. (2014).</li> <li>2. James R. Mihelcic, Julie B. Zimmerman (2010) Environmental Engineering: Fundamentals, Sustainability, Design, USA: Wiley.</li> </ol>	
<b>Grading System</b>	Homeworks	10%
	Design project	10%
	Two Midterm Exams	40%
	Final Examination	40%
<b>Instructors</b>	Dr. Mohamed Abdelhalim Othman (2A94), email; maothman@ksu.edu.sa	
<b>Date of Review</b>	September 2020	