

CE 448 Water and Wastewater Treatment

Department of Civil Engineering King Saud University

<p>Course Description: CE 448 Water and Wastewater Treatment (Required for the B.Sc. degree in Civil Engineering)</p>	<p>Fundamental principles and current practices in water processing, municipal wastewater treatment, and sludge processing. Characteristics of surface and ground waters, and municipal wastewater. Concepts and design of different unit operations and processes for the treatment of water/wastewater. Drinking water standards. Wastewater reuse and disposal criteria. Properties of sludge generated from treatment processes, treatment and utilization. Field trips to water/wastewater treatment plants. 2(2,1,0)</p>
<p>Prerequisite</p>	<p>GE 302 (Industry & Environment), CE 324 (Hydraulics), CHEM 101 (General Chemistry); Topics:</p> <ol style="list-style-type: none"> 1. Hydraulic and energy grade lines. 2. Fluid flow characteristics, and types of flows 3. Drag on immersed bodies. 4. Pumps and blowers. 5. Elements, radical, and compounds. 6. Standards solutions. 7. Chemical equilibrium.
<p>Course Learning Objectives</p>	<p>Students completing this course successfully will be able to:</p> <ol style="list-style-type: none"> 1. Understand the engineering and science principles for the design of water and wastewater treatment systems, 2. Design water/wastewater treatment processes, 3. Understand the operation and maintenance aspects of water and wastewater treatment units, 4. Understand different physical, chemical, and microbiological quality parameters of water and wastewater.
<p>Topics Covered</p>	<ol style="list-style-type: none"> 1. Course Introduction (1 hour) 2. Water Chemistry and Analysis (2 hours) 3. Water Quality Parameter and Criteria (3 hours) 4. Water Treatment Processes: treatment objectives, coagulation and flocculation, sedimentation, filtration, softening, iron and manganese taste and odor control, demineralization (RO), chlorination, chloramination, ozonation, control of disinfection by-products, (12 hours) 5. Wastewater Treatment Processes: characteristics and composition of municipal wastewater, wastewater treatment objectives and effluent requirements/standards, preliminary treatment (screen, shredders, grit chambers, equalization), primary treatment (primary clarification), secondary/biological treatment (biological filtration, activated sludge, oxidation ponds) (10 hours). 6. Characteristics and Treatment of Water/Wastewater Sludge (2 hours)
<p>Class Schedule</p>	<p>Two 50-minute lecture sessions per week. There is also a 1-hr weekly tutorial session.</p>
<p>Treatment Plants Visits</p>	<p>A visit to a water purification plant is arranged at the mid of the term, and another visit is made to a wastewater treatment plant at the end of the term to visualize full-scale treatment facilities, and relate real them to course content. A written report is required for each visit.</p>

Contribution of Course to Meeting the Professional Component	<p>The course:</p> <ol style="list-style-type: none"> 1. Prepares students for designing water and wastewater treatment processes. 2. Equips students with knowledge and experience to develop alternative solutions and methods for different water pollution problems. 3. Enhances student's ability to articulate ideas clearly in written and verbal forms.
Relationship of Course to Program Outcomes	<p>This course will allow students to:</p> <ol style="list-style-type: none"> 1. Apply scientific knowledge for the selection and design of treatment processes. 2. Design different unit operations and processes for the treatment of water, wastewater, and sludge. 3. Offer solutions to problems related to treatment of water and wastewater (e.g. type and degree of and treatment, operational problems of treatment processes). 4. Appreciate and understand responsibilities towards their roles in the design, operation, and maintenance of water and wastewater treatment systems. 5. Study and deal with any issue related to contemporary water and wastewater treatment techniques.
Textbook(s): Other Supported Material:	Hammer, M. J. and Hammer, M. J. Jr. "Water and Wastewater Technology" 6 th edition, Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
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Grade Distribution

Two Mid-term Exams:	40%
Homework:	10%
Visit Reports:	10%
Final Exam:	40%

Homework and Reports

Homework and laboratory and visit reports must be done independently and submitted on time, late submission will be penalized. Submission must be neat and clean on A4 paper.