

<p><b>Kingdom of Saudi Arabia</b> Ministry of Higher Education <b>Qassim University</b> College of Engineering</p>		<p>المملكة العربية السعودية وزارة التعليم العالي جامعة القصيم كلية الهندسة</p>
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**CE 678 Industrial Wastewater Treatment**

**College:** Engineering

**Department:** Civil

**First: Course Definition**

**1- Course Code:** CE 678

**2- Units:** 3

**3- Semester:**

**4- Prerequisite:**

**5- Co-requisite:**

**6- Location** (if not on main Campus):

**Second: Course Objectives**

- 1- To recognize the various sources of industrial wastewater.
- 2- To determine the quantity and quality of industrial wastewater.
- 3- To assess the treatment processes of industrial wastewater in the context of environmental, economic and social factors.
- 4- To discuss the operation of industrial wastewater treatment plant.
- 5- To design the physical-chemical treatment units for industrial wastewater.
- 6- To design the biological treatment units for industrial wastewater.
- 7- To select and design advanced wastewater processes to produce water suitable for a specified end use (i.e. water recycling systems).
- 8- To design treatment systems of industrial wastewater with a focus on safety and sustainability.

**1- Topics to be covered**

Subject	No of Weeks	Units
Quantity and quality of industrial wastewater	1	3
Industrial wastewater flow measurement and minimization	1	3

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Industrial wastewater equalization and neutralization	1	3
Preliminary treatment	1	3
Physical chemical treatment of industrial wastewater	1	3
Physical chemical treatment of industrial wastewater	1	3
Biological treatment of industrial wastewater	1	3
Biological treatment of industrial wastewater	1	3
Advanced treatment of industrial wastewater	1	3
Advanced treatment of industrial wastewater	1	3
Sustainable treatment of industrial wastewater	1	3
Sludge treatment and disposal	1	3
Design of industrial wastewater treatment plant	1	3
Design of industrial wastewater treatment plant	1	3

## 2- Course components (Total hrs in the Semester: 42)

Lecture	Exercise	Other
42	-	0

## 3- Intended Learning Outcomes of the Course (ILO's)

### **a. Knowledge**

#### ***i) Description of the knowledge to be acquired:***

- Preliminary treatment of industrial wastewater.
- Secondary treatment of industrial wastewater.
- Advanced treatment of industrial wastewater.
- Sustainable treatment of industrial wastewater.
- Treatment and disposal of sludge produced from industrial wastewater treatment.
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#### ***ii) Teaching strategies to be used to develop that knowledge***

- Class lectures.
- Term projects.
- Students' presentations.
- Group discussion.

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***iii) Methods of assessment of knowledge acquired***

- Exams.
- Quizzes.
- Homework assignments.
- Term projects.

***b- Cognitive (Intellectual) Skills***

***i) Cognitive skills to be developed***

- Characterization of the industrial wastewater.
- Selection the optimum treatment process for industrial wastewater.
- Differentiation among a variety of factors that influence industrial wastewater treatment.
- Design treatment units for industrial wastewater.

***ii) Teaching strategies to be used to develop these cognitive skills***

- Class lectures.
- Case studies analysis.
- Term projects.
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***iii) Methods of assessment of students' cognitive skills***

- Students' seminars and presentations.
- Term projects.
- Written reports.
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***c. Interpersonal Skills and Responsibility***

***i) Description of the interpersonal skills and capacity to carry responsibility to be developed***

- Decision making based on engineering analysis.
- Communication skills.
- Team work.
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<p><b>ii) Teaching strategies to be used to develop these skills</b></p> <ul style="list-style-type: none"> <li>- Class lectures.</li> <li>- Term projects.</li> <li>- Case studies analysis.</li> </ul> <p><b>iii) Methods of assessment of students' interpersonal skills and capacity to carry responsibility</b></p> <ul style="list-style-type: none"> <li>- Term project.</li> <li>- Written reports.</li> <li>- Students' seminars and presentations.</li> </ul>
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**d. Communication, Information Technology and Numerical Skills**

<p><b>i) Description of the skills to be developed in this domain</b></p> <ul style="list-style-type: none"> <li>- Literature research.</li> <li>- Problems modeling.</li> <li>- Utilization of computer applications in analysis and design.</li> </ul>
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<p><b>ii) Teaching strategies to be used to develop these skills</b></p> <ul style="list-style-type: none"> <li>- Class lectures.</li> <li>- Case studies analysis.</li> <li>- Computer lab sessions.</li> <li>- Term projects.</li> </ul> <p><b>iii) Methods of assessment of students numerical and communication skills</b></p> <ul style="list-style-type: none"> <li>- Term projects.</li> <li>- Written reports.</li> <li>- Students' seminars and presentations.</li> <li>-</li> </ul>
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**e. Psychomotor (if applicable) & Other Non-cognitive Skills**

<p><b>i) Description of the psychomotor or other skills to be developed and the level of performance required</b></p> <ul style="list-style-type: none"> <li>- NA</li> </ul>
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<p><b>ii) Teaching strategies to be used to develop these skills-</b></p> <ul style="list-style-type: none"> <li>- NA</li> </ul>
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**iii) Methods of assessment of student's psychomotor skills**  
- NA

**4- Student Assessment Schedule**

<i>Serial</i>	<i>Assessment tool (test, group project, examination etc.)</i>	<i>Week due</i>	<i>Weight</i>
1	Term Project – 1	3 <sup>rd</sup>	15 %
2	Mid Term Exam -1	7 <sup>th</sup>	15 %
3	Term Project – 2	10 <sup>th</sup>	15 %
4	Term Project – 3	13 <sup>th</sup>	15 %
5	Final Exam	16 <sup>th</sup>	40 %

**5- Student Support**

- Providing electronic library of textbooks and scientific periodicals.
- Providing the necessary computer applications for the course.

**6- Learning Resources**

**i) Essential Books (References)**  
- Eckenfelder W. "Industrial Water Pollution", Publisher: McGraw Hill Higher Education; 3rd edition (2000), ISBN: 978-0071162753.  
- Water Environment Federation. "Industrial Wastewater Management, Treatment and Disposal", 2008. ISBN-13: 978-0071592383.

**ii) Course Notes**  
- NA  
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**iii) Recommended Books**  
- Edwards, J. D. "Industrial Wastewater Treatment: A Guidebook" CRC Press, 1995, ISBN-13: 978-1566701129.

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- Ng, W. J. "Industrial Wastewater Treatment", World Scientific Publishing Company, 2006, ISBN-13: 978-1860946646.

**iv) Electronic Books & Web Sites:**

- Scientific journals and forums.
- Instructor's instruction.
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**v) Periodicals**

- ASCE scientific journals.
- EPA and IWA publications
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**7- Course Evaluation and Improvement Processes**

**i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching**

- Students' questioners.
- Students' evaluation of course and instructor.
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**ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department**

- Public faculty seminars.
- Assessment by external evaluators of students achievements.
- **Instructor (Course) Report**
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**iii) Processes for Improvement of Teaching**

- Assessment of students' work by external examiners.
- Analysis of students' evaluation of course and instructor.
- Seminars by industry professionals.
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**iv) Processes for verifying standards of student achievement**

- Check marking by an independent faculty member of a sample of student work.
- Periodic exchange and remarking of a sample of assignments/exams with a external evaluator.
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**v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.**

- Assessment and evaluation of the level of achieving the course outcomes through a continuous improvement process (part of a quality assurance system established by the university),
- Consequently, actions are to be taken to improve the course delivery when necessary.
- Review of the course objectives, outcomes and curriculum every 2 years.