

<p>Kingdom of Saudi Arabia 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 672 Physical-Chemical Treatment Processes

**College:** Engineering

**Department:** Civil

**First: Course Definition**

**1- Course Code:** CE 672

**2- Units:** 3

**3- Semester:**

**4- Prerequisite:**

**5- Co-requisite:**

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

**Second: Course Objectives**

- 1- To recognize the theory and mechanisms of physical and chemical processes.
- 2- To apply of physical and chemical processes in water and wastewater treatment.
- 3- To explain and calculate the reaction kinetics and catalysis.
- 4- To identify and explain the engineering design principles for the most commonly implemented physical and chemical treatment processes.
- 5- To evaluate the advantages and disadvantages of the common methods for physical and chemical treatment of water and wastewater.
- 6- To design features of the physical and chemical processes.
- 7- To solve problems using mass balance.

<b>1- Topics to be covered</b>		
Subject	No of Weeks	Units
Fundamentals of process kinetics	1	3
Reactor engineering	1	3
Gas transfer	1	3
Aeration	1	3
Coagulation	1	3

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Flocculation	1	3
Screening, sedimentation and floatation	1	3
Filtration,	1	3
Softening	1	3
Tertiary treatment	1	3
Disinfection	1	3
Adsorption	1	3
Ion-exchange and membrane processes	1	3
Chemical sludge treatment and handling	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:**

- Gas-liquid transfer in natural and artificial environments.
- Physical and chemical treatment of water.
- Removal of solids from water.
- Water desalination.
- Removal of solids in wastewater by physical and chemical processes.
- Water and wastewater disinfection.
- Sludge stabilization by physical and chemicals processes.
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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**

- Distinguish the role of various disinfectants in pathogen destruction.
- Selection the optimum process for solids separation.
- Differentiation among a variety of factors that influence gas-liquid transfer.
- Design basic physical and chemical processes used by environmental engineers using newly gained knowledge.

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

- Class lectures.
- Term projects.

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- Case studies analysis.
- iii) Methods of assessment of students' interpersonal skills and capacity to carry responsibility**
- Term project.
  - Written reports.
  - Students' seminars and presentations.

**d. Communication, Information Technology and Numerical Skills**

- i) Description of the skills to be developed in this domain**
- Literature research.
  - Problems modeling.
  - Utilization of computer applications in analysis and design.

- ii) Teaching strategies to be used to develop these skills**
- Class lectures.
  - Case studies analysis.
  - Computer lab sessions.
  - Term projects.
- iii) Methods of assessment of students numerical and communication skills**
- Term projects.
  - Written reports.
  - Students' seminars and presentations.
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**e. Psychomotor (if applicable) & Other Non-cognitive Skills**

- i) Description of the psychomotor or other skills to be developed and the level of performance required**
- NA

- ii) Teaching strategies to be used to develop these skills-**
- NA

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**iii) Methods of assessment of student's psychomotor skills**  
- NA

**4- Student Assessment Schedule**

Serial	Assessment tool (test, group project, examination etc.)	Week due	Weight
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)**  
 - American Water Works Association "Water Quality and Treatment", 6<sup>th</sup> Edition, McGraw-Hill, Inc. (2011), ISBN 978-0-07-163011-5.  
 - Tchobanoglous, G., Burton, F. L. and Stensel, H. D. "Wastewater Engineering, Treatment and Reuse," 4<sup>th</sup> edition, McGraw Hill, Inc., 2002. ISBN-13: 978-0070418783.

**ii) Course Notes**  
 - NA  
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**iii) Recommended Books**

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- HDR Engineering "Handbook of Public Water Systems," 2<sup>nd</sup> edition, John Wiley & Sons, Inc., 200, ISBN-13: 978-0471292111.
- MWH "Water Treatment: Principles and Design," 2<sup>nd</sup> edition, John Wiley & Sons, Inc, 2005, ISBN-13: 978-0471110187.
- Susumu, K. "Integrated Design and Operation of Water Treatment Facilities," Wiley-Interscience, 2000, ISBN-13: 978-0471350934.

**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.

**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.