

<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 670 Chemistry in Environmental Engineering

**College:** Engineering

**Department:** Civil

**First: Course Definition**

**1- Course Code:** CE 670

**2- Units:** 3

**3- Semester:**

**4- Prerequisite:**

**5- Co-requisite:**

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

**Second: Course Objectives**

- 1- To identify the basic chemistry terminology.
- 2- To define the characteristics of chemical compounds and their effect on the environment.
- 3- To differentiate the chemical characteristics of water and wastewater.
- 4- To apply the chemistry in environmental engineering.
- 5- To determine the concentration of chemical pollutants in water and wastewater.
- 6- To learn the necessary knowledge for consequent advanced courses in environmental engineering.
- 7- To evaluate the performance of water and wastewater treatment plants.
- 8- To determine the required chemical parameters for research in environmental engineering.

**1- Topics to be covered**

Subject	No of Weeks	Units
Introduction, General chemistry	1	3
Physical chemistry	1	3
Equilibrium chemistry	1	3

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Organic chemistry	1	3
Biochemistry	1	3
Colloidal chemistry, Basic concept for nuclear chemistry	1	3
Statistical analysis of analytical data, Quantatives chemistry	1	3
Instrumental methods analysis, Standard solutions	1	3
Water and wastewater analysis: pH & turbidity	1	3
Water and wastewater analysis: acidity & alkalinity	1	3
Water and wastewater analysis: Hardness & chloride	1	3
Water and wastewater analysis: DO, BOD & COD	1	3
Water and wastewater analysis: Solids, Fe & Mn	1	3
Water and wastewater analysis: N, P, S, F, oil and grease, gases & trace contaminants.	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:**

- General, physical, colloidal and equilibrium chemistry.
- Organic chemistry and biochemistry.
- Instrumental methods analysis.
- Statistical analysis of analytical data.
- Characterization of water and wastewater.
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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**
- Determination the chemical characteristics of water and wastewater.
  - Analyzing the water and wastewater characteristics.
  - Selection the suitable chemical parameters to control the operation of water and wastewater plants.
  - Determination the chemicals required for water and wastewater treatment.

- 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.
  - 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**

<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)**

- Sawyer C., McCarty P. and Parkin G. "Chemistry for Environmental Engineering and Science". Publisher: McGraw-Hill Science/Engineering/Math; 5 edition (August, 2002). ISBN-13: 978-0072480665.
- Dunnivant F.M. "Environmental Laboratory Exercises for Instrumental Analysis and Environmental Chemistry". Publisher: Wiley-Interscience (August 23, 2004), ISBN-13: 978-0471488569.

**ii) Course Notes**

- NA
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**iii) Recommended Books**

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- American Public Health Association (APHA). "Standard Methods for the Examination of Water & Wastewater". Publisher: American Public Health Association. (October 2005). ISBN-13: 978-0875530475.

**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.

**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.**

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- 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.