

AMERICAN UNIVERSITY OF BEIRUT  
FACULTY OF ENGINEERING AND ARCHITECTURE  
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

**PRGR 665**  
**Water Basics**

Fall Semester 2016-2017

**Course Title:** Water Basics  
**Course Credits:** 2 credits  
**Course coordinator:** Dr. Darine Salam, [ds40@aub.edu.lb](mailto:ds40@aub.edu.lb)

**Course Description:** This course covers basic information about major issues related to water scarcity and quality, and introduces the fundamentals of water chemistry and microbiology, as well as water treatment.

**Course Prerequisites:** Elementary Chemistry and Microbiology

**Course Material:** PowerPoint lecture slides, reading materials, activities and assignments, and other resources will be placed on Moodle as the course proceeds.

**Course Objectives:** The course will:

- Introduce students to the global water scarcity problem and to alternative water supply options.
- Introduce students to fundamentals of water chemistry and microbiology that are essential for water quality assessment and water treatment.
- Introduce students to fundamental water treatment processes
- Familiarize students with laboratory analytical methods and techniques used to determine specific water characteristics.

**Course Material:** The course is formed of 5 modules. The different modules including the session material, activities and assignments are outlined in the below table.

MODULE	DATE (2016)	MODULE MATERIAL	ACTIVITIES/ DELIVERABLES	DUE DATE (2016)
INTRODUCTION TO WATER ESSENTIALS	September 19-October 2	> PPT <ul style="list-style-type: none"> <li>• Earth's water distribution</li> <li>• Hydrologic cycle</li> <li>• Water budget</li> <li>• Water scarcity</li> <li>• Water footprint</li> </ul> > Required readings and case studies > Additional resources	Introduce Yourself: Icebreaker	Sunday, October 2
			Estimate the annual national water budget in your country.	
			Estimate your daily water footprint	
			Water scarcity: Reasons and potential solutions	
WATER CHEMISTRY	October 3-October 16	> PPT <ul style="list-style-type: none"> <li>• Types of water impurities</li> <li>• Water buffer system</li> <li>• Water chemical characteristics</li> </ul> > Solved examples	Response of the carbonate buffer system to CO <sub>2</sub> bubbling and stripping	Sunday, October 16
			Lime and soda ash softening	
WATER MICROBIOLOGY	October 17-October 30	> PPT <ul style="list-style-type: none"> <li>• Water pathogens and parasites</li> <li>• Waterborne diseases</li> <li>• Indicator microorganisms</li> </ul> > Readings and case studies > Standard methods for water analysis	National statistics on waterborne diseases	Sunday, October 30
			Laboratory testing of water samples	

MODULE	DATE (2016)	MODULE MATERIAL	ACTIVITIES/ DELIVERABLES	DUE DATE (2016)
WATER QUALITY	October 31- November 13	> PPT <ul style="list-style-type: none"> <li>• Water contaminants and their sources</li> <li>• Water quality characteristics</li> <li>• Water quality standards</li> </ul> > Readings and case studies > Additional resources	Water quality compliance with standards	Sunday, November 13
WATER TREATMENT	November 14- November 27	> PPT <ul style="list-style-type: none"> <li>• Coagulation and Flocculation</li> <li>• Sedimentation</li> <li>• Filtration</li> <li>• Disinfection</li> <li>• Storage</li> </ul> > Readings and case studies > Additional resources	Water quality and treatment considerations I Water quality and treatment considerations II	Sunday, November 27

**Learning Outcomes:**

Upon completion of this course, students will be able to:

- Discuss the problem of water scarcity and propose ways to conserve water.
- Gain fundamental understanding of the water chemistry characteristics as they relate to water quality and treatment.
- Discuss water microbiology, waterborne diseases, indicator microorganisms, and control strategies of pathogenic microorganisms used in water disinfection
- Define water contaminants and their sources, and discuss water quality characteristics and standards as they relate to the ultimate water use
- Discuss the different processes used in water treatment and define appropriate treatment process stream depending on water source and ultimate use.
- Conduct laboratory analysis to determine basic water chemical and bacteriological characteristics

**Grading:**

There would be no exams in this course. Instead, the successful completion of 12 activities addressing the different discussed topics and course objectives and learning outcomes is necessary for the fulfillment of the requirements of this course. The different activities and their associated grades are provided in the below table.

ACTIVITY	DESCRIPTION	DUE DATE (2015)	GRADING
1	Introduce Yourself: Icebreaker	Sunday, October 2	5
2	Estimate the annual national water budget in your country.	Sunday, October 2	15
3	Estimate your daily water footprint	Sunday, October 2	15
4	Water scarcity: Reasons and potential solutions	Sunday, October 2	15
5	Response of the carbonate buffer system to CO <sub>2</sub> bubbling and stripping	Sunday, October 16	5
6	Lime and soda ash softening	Sunday, October 16	20
7	National statistics on waterborne diseases	Sunday, October 30	15
8	Laboratory testing of water samples	Sunday, October 30	30
10	Water quality compliance with standards	Sunday, November 13	30
11	Water quality and treatment considerations I	Sunday, November 27	20
12	Water quality and treatment considerations II	Sunday, November 27	30