

SEMESTER AT SEA COURSE SYLLABUS
University of Virginia, Academic Sponsor

Voyage: Fall 2014

Discipline: Civil Engineering, open to non-engineering students

CE 3100: Water for the World

Division: Upper

Faculty Name: Dr. Richard D'Amato

Credit Hours: 3; Contact Hours: 38

Pre-requisites: None

COURSE DESCRIPTION

Water is the Earth's most precious resource. This course introduces students interested in sustainable international development and global issues to one of the major challenges we face today: how to provide safe drinking water to 1 billion people and adequate sanitation to 2.6 billion people who currently lack these basic services. Students will learn the fundamentals of water quality, water borne diseases, and the basic principles of water and wastewater treatment. One major concern will be how to select appropriate and sustainable technologies for water and sanitation in developing countries.

COURSE OBJECTIVES

The goal of this course is to develop students' knowledge and understanding of the highly complex issues surrounding water, its availability and uses on a global basis. This will include its history, current global water issues, water treatment processes for clean drinking water, wastewater treatment and solid waste management, worldwide. Special emphasis will be given to understanding systems in the countries visited on the fall semester at sea voyage. This goal will be accomplished through five objectives:

1. To understand the global issues surrounding the uses and needs of water.
2. To understand the current issues associated with provision of clean drinking water and improved sanitation to the world's population.
3. To build students' knowledge and comprehension of the history of water and sanitation infrastructure.
4. To develop a global perspective on water supply and waste treatment.
5. To understand the role of physical, chemical and biological principles in potable water and wastewater treatment processes and solid waste management.

REQUIRED TEXTBOOKS

AUTHOR: Maggie Black & Janet King

TITLE: The Atlas of Water: Mapping the World's Most Critical Resource

PUBLISHER: University of California Press

ISBN #: 978-0-520-25934-8

DATE/EDITION: 2009/2nd Edition

COST: \$22.95

AUTHOR: Joanne E. Drinan and Frank R. Spellman

TITLE: Water and Wastewater Treatment: A Guide for the Nonengineering Professional

PUBLISHER: CRC Press

ISBN #: 978-1439854006

DATE/EDITION: 2012/2nd Edition
COST: \$83.15

TOPICAL OUTLINE OF COURSE

NOTE: Readings are from Drinan & Spellman (D&S) and Black and King (B&K). Tentatively the schedule will look like (based on B schedule):

Depart Southampton- August 23

B1- August 26: Introductions, Course Overview and Requirements, What do you know about water, a remarkable substance? Let's Organize Your Water Knowledge. Let's begin with B&K Part 1 A Finite Resource

B2- August 28: - B&K Part 1 A Finite Resource, D&S Chapter 1 Current Issues in Water and Wastewater Treatment Operations

St. Petersburg: August 29- September 2

B3- September 2: D&S Chapter 1 Current Issues in Water and Wastewater Treatment Operations

B4- September 4: B&K Part 2 Environmental Pressures

Gdansk: September 5-7

Rostok: September 8-9

B5- September 11: D&S Chapter 2 Water Regulations, Parameters and Characteristics D&S Chapter 3 Water Purification: System Overview

B6- September 13: D&S Chapter 4 Sources, Intake, and Screening, D&S Chapter 5 Coagulation and Flocculation

Antwerp: September 14-16*

Le Havre: September 17-19

B7- September 21: D&S Chapter 6 Sedimentation, D&S Chapter 7 Filtration

B8- September 23: D&S Chapter 8 Disinfection, D&S Chapter 9 Distribution.

Dublin: September 24-27

B9- September 29: B&K Part 3 Water for Living. Prepare for Lisbon and LAB

Lisbon: October 1-3* (**LAB** October 1)

Cadiz: October 4-5

B10- October 6: What did we see? D&S Chapter 10 WW Regulations, parameters, and Characteristics, D&S Chapter 11 WW Sources and Types. REVIEW A

Casablanca: October 8-11

B 11- October 12: D&S Chapter 12 WW Treatment: Basic Overview, D&S Chapter 13 Collection Systems, D&S Chapter 14 Preliminary Treatment. REVIEW B

B12 – October 14: MID-TERM EXAMINATION

Dakar: October 16-19

B13-October 20: D&S Chapter 15 Primary Sedimentation, D&S Chapter 16 Biological Treatment, D&S Chapter 17 Secondary Treatment

B14- October 22: D&S Chapter 18 Advanced Treatment, D&S Chapter 19 Wastewater Disinfection, D&S Chapter 20 Discharge Effluent

B15- October 24: B&K Part 4 Water for Economic Production (Possible Faculty led trip to Akosomba Dam and Lake Volta!)

Takoradi: October 25-26*

Tema: October 27-28

B16- October 30: D&S Chapter 21 Water Solids Management: Systems Overview, D&S Chapter 22 Water Solids Treatment and disposal

B17- November 1: B&K Part 5 Damaged Water

Study Day: November 2

B18- November 4: D&S Chapter 23 Wastewater Biosolids Management: System, D&S Chapter 24 Wastewater Biosolids Treatment, D&S Chapter 25 Wastewater Biosolids Disposal

B19- November 6: D&S Chapter 25 Wastewater Biosolids Disposal, B&K Part 6 Water for the Future

Rio de Janeiro: November 7-9*

In Transit: November 10-11

Salvador: November 12-14

B20- November 16: B&K Part 6 Water for the Future, B&K Part 7 Data Tables

B21- November 18: B&K Part 6 Water for the Future, B&K Part 7 Data Tables and final sum-up.

Study Day- November 19

B22- November 21: Research Project Presentations

Bridgetown: November 22-24

B23- November 26: Research Project Presentations

B24- November 28: REVIEW

Havana: November 29- December 2

Study Day: December 3

B25-December 5 FINAL

Ft. Lauderdale: December 8

FIELD WORK

Field lab attendance is mandatory for all students enrolled in this course. Please do not book individual travel plans or a Semester at Sea sponsored trip on the day of our field lab.

FIELD LAB: The Water Museum in Lisbon (October, 1)

We will visit the Water Museum in Lisbon that has four branches: an 18th century aqueduct, an old pumping station, two reservoirs and numerous fountains around Lisbon. We will also try to visit a modern water treatment facility We will be experiencing water management through the ages. This would be a history of the water supply from the 18th century to the present. Students will appreciate the complexity of the processes and importance of delivering water for a civilized society. A scientific journal will be maintained highlighting some of the components for water collection and delivery studied and now observed. The journal will contain a reflection section.

FIELD ASSIGNMENTS

- Students will be required to attend the Field Lab. Absence from the Field Lab will result in a loss of 20% of the course grade.
- Each student will prepare a written document describing the Field Lab experience highlighting what is learned, how it fits within material covered in class and reflections.
- For non-required field excursions, students will be expected to observe local water collection, processing and uses during the voyage noting any perceived environmental issues. How has class study and observations altered your perspective and understanding of potable water production and consumption. The results of these observations are to be included in the written Team Project Report. Instructor will be able to make suggestion on possible field excursions.
- Several options for instructor led field excursions will be available. One might be to the Akosombo Dam and Lake Volta reservoir in Ghana. Attempts will be made to locate a desalination plant near one of our ports.
- Students will be expected to take photographs and/or videos of relevant water-related activities.
- Each written documents describing the field experience can have the benefit of the instructor as a consultant to polish the paper before submission.

METHODS OF EVALUATION / GRADING RUBRIC

TEAM PROJECT: The instructor will assign each student to a team of 3 or 4 students to work on a term long project. Each team will report on the status of access to water and sanitation services and the implications of this status for public health and sustainable development in one of the countries visited on the voyage as a case study. Students may take and include photographs and videos. All the team projects will be assembled into an electronic portfolio documenting the water issues in the countries visited as a take-away from the course.

INDIVIDUAL RESEARCH PROJECT: Each student will be responsible for selecting a meaningful topic on some water issue and writing a report and preparing an in-class presentation. Topics may be social, political, economic, cultural or technological in scope. For example, researching how the arid Morocco handles water demand for population, agriculture, industry and power. It is a coastal country. Is desalination an option? Other topics might include the effects of global climate change

on a particular country or region; the effect of neighboring countries handling of sanitation and water usage, etc.

10% Attendance and Class Participation
15% Mid-term Examination
10% Team Paper on Water Resources and Uses in a Country Visited or Near By
20% Individual Research Project Paper and Presentation
20% Field Lab (participation and e-portfolio (with reflections))
25% Final Examination
Total 100%

RESERVE LIBRARY LIST

AUTHOR: Brian Fagan
TITLE: Elixir: A History of Water and Humankind
PUBLISHER: Bloomsbury Press
ISBN #: 978-1608190034
DATE/EDITION: June 2011

AUTHOR: Steven Solomon
TITLE: Water: The Epic Struggle for Wealth, Power and Civilization
PUBLISHER: Harper Perennial
ISBN #: 978-0060548315
DATE/EDITION: January 2011

AUTHOR: Carsten Hollaender Laugesen and Ole Fryd
TITLE: Sustainable Wastewater Management in Developing Countries: New Paradigms and Case Studies from the Field
PUBLISHER: ASCE Press
ISBN #: 978-0784409992
DATE/EDITION: December 2009

AUTHOR: Viessman, W., Hammer, M.J., and Chadik, P.A.
TITLE: Water Supply and Pollution Control
PUBLISHER: Pearson Prentice Hall
ISBN #: ISBN-13: 978-0132337175
DATE/EDITION: 2009, 8th edition

ELECTRONIC COURSE MATERIALS

None presently.

ADDITIONAL RESOURCES

The instructor will have a library of personnel books for student use and reference.

HONOR CODE

Semester at Sea students enroll in an academic program administered by the University of Virginia, and thus bind themselves to the University's honor code. The code prohibits all acts of lying, cheating, and stealing. Please consult the Voyager's Handbook for further explanation of what constitutes an honor offense.

Each written assignment for this course must be pledged by the student as follows: "On my honor

as a student, I pledge that I have neither given nor received aid on this assignment.” The pledge must be signed, or, in the case of an electronic file, signed “[signed].”