SEMESTER AT SEA COURSE SYLLABUS

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
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)

Depart Southampton- August 23

A1- August 25: Introductions, Course Overview and Requirements, Current Issues D&S pp 3-9 and B&K pp 9-15

A2- August 27: -What do you know about water, a remarkable substance? Let's Organize Your Water Knowledge, Instructor notes.

St. Petersburg: August 28- 30

A3- September 1: Brief History of Water and Sanitation, notes from instructor

Hamburg: September 2-5

A4- September 7: Water And Sanitation Overview In The Countries To Be Visited; B&K pp 101-117

Antwerp: September 8-10
Le Havre: September 11-13

A5- September 15: Water: A Finite Resource: The Global Water Pot, Water Shortage, Rising Demand, Dwindling Supply and Competition and Conflict; B&K pp 18-29 and D&S pp 7-17

Galway: September 16
In transit: September 17
Dublin: September 18-19

A6- September 21: Environmental Pressures: Climate Change, Urbanization, Altered 3 Flows, Draining Wetlands, Dry Lands, Droughts and Floods; B&K pp 30-43

Lisbon: September 23-25
Cadiz: September 26-28

A7- September 29: Water For Living: Water for Drinking, Water for Sanitation, Water at Home, Water and Disease, Disease Vectors, Water for Food and Dispossession by Water; B&K pp 45-59

Casablanca: October 1-4

A8- October 5: Water For Economic Production: Irrigation, Water for Industry, Water for Energy, Water for Fisheries, Transport, Leisure and Water for Sale; B&K pp 61-73

A9- October 7: Damaged Water: Water Pollutants, Water Pollution, Damaged Waterways and Threatened Ecologies; B&K pp 75-84

Study Day: October 8

A10- October 10: Water For The Future: Millennium Development Goals, Treaties and Obligations, Deepening Co-operation, Managing Water, Water Footprint, Water at a Price and Technological Fixes; B&K pp 85-99

Tema: October 11-14

A 11- October 16: MID-TERM EXAMINATION

Study Day: October 18

A12 – October 19: Current issues and Water Regulations D&S pp 3-69

Cape Town: October 21-25

A13- October 26: Unit Operations For Producing Clean Drinking Water: Purification and Sources D&S pp. 71-87
Study Day: October 28:

A14- October 29: Clean Drinking Water 2: Coagulation, Flocculation, and Sedimentation D&S pp 89-97

A15- October 31: Clean Drinking Water 3: Filtration and Disinfection D&S pp 99-118

Study Day: November 2

A16- November 3: Clean Drinking Water 4: Distribution. D&S pp. 119-125 Clean water review

Buenos Aires: November 5-7
Montevideo: November 8-10

A17- November 11: Unit Operations For Wastewater & Sewage Treatment: Wastewater Characteristics, Sources, Types and Treatment, D&S pp 129-146

A18- November 13: Wastewater & Sewage Treatment 2: Collection Systems, Preliminary Treatment, Primary Sedimentation D&S pp 149-172

Rio de Janeiro: November 14-16

A19- November 18: Wastewater & Sewage Treatment 3: Biological Treatment and Secondary Sedimentation, D&S pp 173-193

A20- November 20: Advanced Treatment, Disinfection and Discharge Effluent, D&S pp 195-216

Study Day- November 21

A21- November 23, Management Of Solid Waste, D&S pp 219-258 Sustainable clean water development & sanitation
systems, notes from instructor

Manaus- November 25-27

Study Day- November 28

A22- November 29: Research Project Presentations

A23- December 1: Research Project Presentations

A24: FINAL EXAMINATION

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 (*At least 20 percent of the contact hours for each course, to be led by the instructor.*)

Lab Proposal # 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 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.

Lab Proposal #2

Tour either or both water/wastewater treatment facilities in Dublin. Water is extracted from a number of sources. All water must be "prepared" for human consumption; the job of the water treatment facility. Wastewater must be prepared for environmentally safe disposal. What of recycling? These processes will be inspected by the student during our plant tours. Applied science at work. Students will appreciate the complexity of the processes and importance for a civilized society. A scientific journal will be maintained highlighting all the unit process operations 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 Atosombo Dam and 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]."