SEMESTER AT SEA COURSE SYLLABUS
University of Virginia, Academic Sponsor

Voyage: Spring 2016
Discipline: Engineering (open to non-engineering students)
Course Title: CE 3100-101: Water for the World
Division: Lower
Faculty Name: John Tyner, Ph.D., P.E., P.G.
Credit Hours: 3; Contact Hours: 38
Pre-requisites: None

COURSE DESCRIPTION

Water is fundamentally linked to life. Without sufficient availability of clean fresh water, humans suffer. Unfortunately, through the act of using water, humans generally degrade water quality. In modern societies (e.g., your hometown, Japan, Hong Kong) water is treated to governmental regulatory standards prior to usage and treated again prior to its release back into the environment. In less developed societies (e.g., India, Ghana) neither pre nor post water treatment may be available to the populace. You will see firsthand the cost of not having access to clean water during our various port visits. In this course we will begin by examining the hydrologic cycle and how it can be used to estimate fresh water availability. Modern and traditional methods for potable water treatment and wastewater treatment will be discussed. Lastly, we will examine the ethics of water: ownership, usage, mining, and industrial pollution, and how decisions related to water have affected peoples of the world.

COURSE OBJECTIVES

The goal of this course is to provide a conceptual understanding of water, what makes it unique, and how it behaves on the Earth and other planets, so that students can better assess the complex issues associated with how it affects human populations. We will pay special attention to water issues in the countries we will visit. This goal will be met by concentrating on the following objectives:

1. Understand the basic chemistry of water, and how this leads to the unique properties of water.

2. Understand the hydrologic cycle and how it affects human populations.

3. Understand the complex interplay between water, politics, law, and international relationships.

4. Understand world human population dynamics and the associated drinking water and sanitation needs.

5. Understand the how climate change can impact the cycling of water and affect on human populations.

6. Reflect and express how water use and consumption impacts each of us personally over the course of a semester.

REQUIRED TEXTBOOKS

Introduction to Water Resources and Environmental Issues (IWR)
AUTHOR: Pennington and Cech
PUBLISHER: Cambridge University Press
ISBN-13: 978-0521869881, ISBN-10: 0521869889
DATE/EDITION: 2010 1st Ed.

Note: On 4/15/2015 the Amazon lists the new prices as $74. Used copies are available for significantly less.

TOPICAL OUTLINE OF COURSE

Note: The textbook chapters have been assigned in an order that aligns with our itinerary, so that the various subjects may be understood partly in relation to our experiences at the ports. When you visit various ports, please pay particular attention to color coded lecture material and readings that correspond to the same color coded port. You may expect the pre-and/or post lectures following ports visits to discuss what you might/did experience while visiting the ports in relation to the class material.

Depart Ensenada- January 5:

B1- January 8: Course introductions and the unique physics of water (ungraded in-class writing assignment) (Chapter 1, IWR)

B2- January 10: The distribution and accessibility of fresh water on earth (Chapter 2, IWR)

B3- January 13: Managing fresh water on a small rocky island (**TIP**)

Honolulu: January 12

B4- January 15: The hydrologic cycle I (Chapter 3, IWR)

B5- January 18: The hydrologic cycle II (Chapter 3, IWR)

Study Day: January 19

B6- January 21: Groundwater (Chapter 6, IWR)

B7- January 23: Groundwater contamination and cleanup methods (Chapter 1, CH)

Yokohama: January 24-25
In-Transit: January 26

Kobe: January 27-28

B8- January 30: Watershed Basics (Chapter 5, IWR)

Shanghai: January 31-February 1
In-Transit: February 2-3
Hong Kong: 4-5

B9- February 7: Journal Reflections I, Each student will present several minutes on their thinking about water at this point in the course - turn in Journals (Chapter 1, PB)

Ho Chi Minh: February 8-12

B10- February 14: Rivers and fluvial morphology (Chapter 8, IWR)

Study Day: February 15

B11-February 17: Wetlands (Chapter 9, IWR)

Yangon: February 18-22

B12- February 24: Drinking and wastewater treatment (Chapter 11, IWR)

B13- February 26: Exam 1

Cochin: February 27-March 3

B14- March 5: Journal Reflections II, Each student will present several minutes on their thinking about water at this point in the course - turn in Journals (Chapter 4, IWR)

Study Day: March 6

B15- March 8: Urban Hydrology I (Chapter 11 page 399 - 422, IH)

Port Louis: March 9

B16- March 11: Urban Hydrology II (Chapter 11 page 422 - 451, IH)

Study Day: March 12

B17- March 14: Dams and Reservoirs (Chapter 10**,** IWR)

Cape Town: March 15-20

B18- March 22: Water law and water conflicts (Chapter 12, 14, IWR)

B19- March 24: Water Budgeting: at the household scale, and the landscape scale (EPA WaterSense Water Budget tool, download and familiarize yourself with spreadsheet based tool)

B20- March 25: Mine water usage (review CMPs)

Takoradi: March 27-28
Tema: March 29-31

B21- April 2: The ethics of water availability and pricing. *Come prepared to make a defense of your position towards water pricing: ownership, flat fee, tiered system, above cost of delivery, lettuce, versus almonds, versus vegetables, versus milk, versus green yards, versus industry other? Whatever position you take, myself and others will oppose it vehemently. The remaining students will decide who makes the most compelling argument.*

B22- April 4: Design Presentation and Report (Each team will give a 10-15 min presentation and report describing their designed solution for a small-scale water harvesting system suitable for one of our host countries)

B23- April 6: Review and Journal Reflections III, Each student will present several minutes from their journals - turn in Journals (Chapter 13, IWR)

Casablanca: April 7-11

Study Day: April 12

B24- B Day Finals, April 14: Final

April 16: Disembarkation Day

FIELD WORK
Experiential course work on Semester at Sea is comprised of the required field lab led by your instructor and additional field assignments that span multiple ports.

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

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

The field lab for this course takes place out of Tema: Date TBA

We are planning a site visit to the Akosombo dam in Ghana. This dam created the largest manmade lake in the world, Lake Volta. The associate hydroelectric project generates approximately 1 gigawatt of electrical power. The construction of the lake displaced approximately 80,000 people and greatly influenced the environment. Obviously dams have

both positive and negative outcomes. During our investigation of the dam, we will discuss them both.

Each student will complete an extended journal entry that describes their assessment of the value (positive and/or negative) of the Akosombo dam. If you had it to do again, would you rebuild the dam? If yes, justify. If no, predict the consequences of having no dam. In either case discuss both the pros and cons with suitable defenses.

FIELD ASSIGNMENTS (Ghana Lab and other Port Stops)

- Students will be required to attend the Ghana field lab. Absence from the lab will result in a 20% loss of the course grade.
- Each student will prepare an extended journal entry dealing solely with the field lab experience.
- Students are also expected to provide journal entries from each port stop dealing with some aspect of water that they observed. Journal entries may be supplemented with photos or other relevant materials from their port journeys. Journals may be written, or some may be in electronic format as a blog.
- The Ghana field lab journal entry will receive a separate grade from the rest of the journal, and count towards 10% of the student's overall grade (20% including attendance).

THE JOURNALS

Each student will create a journal that includes their in-class notes and daily personal entries. This journal will be graded at various times during the semester, and will constitute 30% of your course grade. This journal will become your own personalized textbook of experiences and thoughts that originate both inside and outside of the classroom. Basically, you will build this journal during our class periods, our field trip, from out-of-class discussions with classmates and perhaps professors, and after some personal reflection of what you learn each day. Your journal will contain written notes, and perhaps written daily entries, although you may elect to put some or all of the daily entries into electronic format as a blog. You may structure your notebook anyway you desire, but you must at least include:

1) Class notes/drawings from each class period.

2) An additional entry from every day reflecting on what was learned in class, what you learned from assigned readings, and how this information relates to you personally. On those days when we do not have class, you will spend some time thinking about the lessons learned in previous classes, and how that information relates to things that interest you. This is essentially the "diary" portion of the notebook where I want you to step back and assess the importance of what you have learned each day. This section will be your own personal account of the value of this portion of the class. You will want to consider new things that you learn each day, and whether or not you believe that these lessons will be of value to you in the future. I want you to be honest with your reflections. Your grade for this task will be based on how clearly and thoroughly you convey your thoughts, and not

on whether I agree with your assessment. Feel free to be creative, and run with your thoughts. Create a record of your thinking.

In addition, you may include:

1) Diagrams and accompanying explanations of things you see during our port stops. You may want to bring colored pencils with you as you travel around to aid you with this task. If you wish, you can also photo-document various aspects of water use or consumption that you see.

2) Anything else you want to include. I do not want to place boundaries on where you take this exercise. Each student brings a different set of background experiences to this class that will affect their learning. Be as creative as you wish!

There are several goals that accompany creating and keeping a class journal. First, it will require that you constantly think and reflect upon what you learn, and what you see and experience. I've found that this enriches our classroom discussions, and enables us to delve deeper into this subject. It also requires you to write each day, and I want each of you to practice clear, concise writing. Finally, it is a record of what you learned and what you thought about over a semester that may be transformative for you, and you may find it enlightening and useful later in life to page through this journal.

NOTE: I want you to start your journal by writing your first reflection piece at the end of our first lecture. This first entry should focus on what your goals are for this course, and what you anticipate learning during this semester. I think you will find it interesting after the course is finished to compare your goals at the outset of the course with your final reflection piece where you summarize what you learned during the semester.

METHODS OF EVALUATION / GRADING RUBRIC

20% - Field Lab and Field Lab Journal Entry (10% attendance, 10% quality of journal entry)
20% - Midterm
25% - Final Exam
20% - Design Project (10% presentation, 10% report)
5% - Journal Reflection and Check I
5% - Journal Reflection and Check II
5% - Journal Reflection and Check III

Please note attendance and participation is required on Semester at Sea. Absences are only excused when accompanied by a note from the clinic.

RESERVE BOOKS AND FILMS FOR THE LIBRARY

Contaminant Hydrogeology (CH)
AUTHOR: C.W. Fetter
PUBLISHER: Prentice Hall
ISBN 0-02-337135-8

DATE/EDITION: 1993

Introduction to Hydrology (IH)
AUTHOR: G. W. Lewis
PUBLISHER: Prentice Hall
ISBN 0-67-399337-X
DATE/EDITION: 2002/Fifth

Plan B 3.0: Mobilizing to Save Civilization (PB)
AUTHOR: L. R. Brown
PUBLISHER: W. W. Norton and
Company Hall
ASIN: B0010SEM7S
DATE/EDITION: 2008

ELECTRONIC COURSE MATERIALS

Electronic copies of Coal Mine Permits (**CMP**)

Falkland, A. 1999. Tropical island hydrology and water resources. 2nd International Colloquium on the Hydrology and Water Management in the Humid Tropics. (**TIP**)

Other electronic course materials will be made available as needed.

ADDITIONAL RESOURCES

May be supplied by the instructor through the course folder.

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]."