Florida International University
Department of Civil and Environmental Engineering

Course Syllabus
ENV 3001: Introduction to Environmental Engineering (3 credits)
Fall Semester 2017: August 21, 2017 – December 9, 2017

Overview:

The role of the environmental engineer is to protect public health and safety from the adverse effects of pollution and to ensure that nature's ecosystems are not adversely affected as they are used to benefit man. This course introduces students to environmental problems and their solution including water and wastewater treatment, air pollution and control, and solid and hazardous waste management. A significant portion of the course is devoted to a review of general and physical chemistry. The associated laboratory class ENV 3001L illustrates several analytical techniques commonly used in the analysis of environmental samples, and demonstrates the mechanisms involved in some of the treatment processes. This course also discusses differences in population growth and demography, resource consumption, and the resulting environmental impacts between different regions of the world, thereby addressing FIU's Global Learning outcomes.

Catalog Course Description:

Introduction to environmental engineering problems; water and wastewater treatment, air pollution, ~~noise~~, solid and hazardous wastes.

Prerequisites:

CHM 1046 and CHM 1046L, and MAC 2312.

Corequisite:

ENV 3001L Environmental Laboratory

Instructor:

Dr. Shonali Laha, P.E.
Office Location: EC 3742
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Office Hours: Tuesdays and Wednesdays 15:30 – 17:00, and by appointment.
Course Website: http://faculty.fiu.edu/~lahas/

Location and Timing:

Room: EC 1112
Mondays and Wednesdays 14:00 – 15:15

Final Examination:

Wednesday December 13, 2017: 1200 – 1400

Textbook:

Gilbert Masters and Wendall Ela, *Introduction to Environmental Engineering and Science*, Third Edition, Prentice-Hall, Inc., 2007 (ISBN: 13:978-0-13-148193-0)

Excellent Science Reading:

Bill Bryson, *A Short History of Nearly Everything*, Broadway Books, 2003.
Alan Weisman, *The World Without Us*, St Martin's Press, 2007.
Elizabeth Kolbert, *The Sixth Extinction*, Henry Holt and Company, 2014.
Mark Lynas, *The God Species: Saving the Planet in the Age of Humans*, The National Geographic Society, 2011.
Tony Juniper, *What Has Nature Ever Done For Us? How Money Really Does Grow on Trees*, Synergistic Press, 2013

Useful Reference Books:

Howard, A.G., *Aquatic Environmental Chemistry*, Oxford University Press, 1998 (ISBN: 0-19-850283-4)

This inexpensive little text is particularly helpful in clarifying concepts in environmental chemistry and in highlighting the relevance of chemistry to environmental engineers. I believe that it will also help you in successfully completing your accompanying laboratory class ENV 3001L.

Davis and Cornwell, *Introduction to Environmental Engineering*, McGraw-Hill, 1991
Sawyer and McCarty, *Chemistry for Environmental Engineering*, Third Edition, McGraw-Hill, Inc., 1978
Benefield, Judkins, and Weand, *Process Chemistry for Water and Wastewater Treatment*, Prentice-Hall, Inc., 1982
Tchobanoglous and Schroeder, *Water Quality*, Addison-Wesley Publishing Company, 1985

Global Learning Outcomes:

1. Global Awareness: Students will demonstrate an understanding of the interrelatedness of environmental problems around the world, that these problems have no national borders, and that the extent of these problems is affected by the different socioeconomic, technological, and other conditions.
2. Global Perspective: Students will be able to conduct an analysis of the global nature of a selected environmental problem and the extent to which factors such as economics, technology, and society contribute to the problem.
3. Global Engagement: Students will demonstrate a willingness to develop an engineering solution, process, or technology that reduces adverse environmental impact, is more sustainable, and is appropriate within the framework of economic, technological, and societal factors at national, regional, and global levels.

Exit Competencies:

After successful completion of this course students should be able to:

1. Articulate the role of the environmental engineer in protecting public health and safety, and in restoring/preserving natural resources
2. Understand the relevance of concepts in general and physical chemistry in determining the quality and treatment options for water supplies, wastewater, and air pollution
3. Apply mass balance, chemical kinetics, and other empirical and semi-empirical concepts and techniques in developing basic treatment schemes.
4. Gain familiarity with both the traditional and the less common environmental contaminants
5. Identify unit operations/processes likely to be successful at eliminating these contaminants.

Grading Criteria:

The final grade will be based on the following criteria totaling 100 points:

Midterm Exams	40
Final Exam	20
Quizzes (best eight)	40

General Observations/Policies:

Following poor attendance in the Fall 2012 semester accompanied by extremely poor performance, I discontinued giving credit for assignment submittal. Instead I will grade your understanding of material through quizzes. *These may be announced beforehand or be "surprise" quizzes*. Please note that the attached schedule is tentative, serves only as a guideline, and is liable to change. You do not need to worry about occasional absences from class because I will allow two quizzes to be dropped, i.e., plan to get in ten quizzes through the semester and will select the best eight for *each* student. The introductory environmental class is very wide in scope and although I believe that much of the information is intuitive and self-explanatory, you need to be sure to understand the concepts! Although the environmental laboratory class (ENV 3001L) is scheduled with another professor, Dr. Bricker, the material covered in the lab will emphasize much of the chemistry in the theoretical sessions. Again, make sure you understand materials and clear any conceptual doubts, and I am sure that you will clear both ENV 3001 and ENV 3001L with flying colors! Your quiz performance will also serve as an indicator of attendance.

A note about professional registration: engineering is a profession and typically we want to become licensed engineers with a P.E. designation. Toward that goal, all undergraduates are encouraged to take the first step toward licensure while still in school – passing the FE exam. Check the NCEES (http://ncees.org/) and FBPE (https://fbpe.org/) websites for information. Furthermore, since I hope many of the ENV 3001 students are sophomores, I want you to be aware of the 3+2 program at FIU's CEE that allows you to obtain both an MS and BS degree in five years. Typically an MS degree requires an additional 30 credits; however, the 3+2 program double counts 9 credits toward both the BS and MS degrees, and requires only 21 additional credits beyond the BS to secure the MS degree! Please check with Ms JoAnna Sanabria if you are eligible for the 3+2 program.

I cannot tolerate cell phones ringing during class hours nor inattention. Please turn off the ringers and switch off laptops as a courtesy to your fellow classmates and me – I will certainly penalize violators of this principle in their grade. I am aware I know some of you are accustomed to write notes directly onto your laptops, but try not to distract me!

Also review the "University Misconduct Statement" attached below.

University Misconduct Statement

Florida International University is a community dedicated to generating and imparting knowledge through excellence in teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.

Misconduct includes: Cheating – The unauthorized use of books, notes, aids, electronic sources; or assistance from another person with respect to examinations, course assignments, field service reports, class recitations; or the unauthorized possession of examination papers or course materials, whether originally authorized or not. Plagiarism – The use and appropriation of another's work without any indication of the source and the representation of such work as the student's own. Any student who fails to give credit for ideas, expressions or materials taken from another source, including internet sources, is responsible for plagiarism.

Tentative Class Schedule:

Date	Lec	Topic	Chapter
8/21	1	Course introduction (HW-1, due 8/30: Read the article on solid waste generation, watch the TED lectures and movie *Home*.)	
8/23	2	Mass and energy transfer concepts. Spreadsheet usage, library resources. (HW-2: due 9/6)	1
8/28	3	**Quiz 1.** More mass and energy balance concepts.	1
8/30	4	Mass and energy transfer problem solving/HW-2 discussion.	1
9/4		Labor Day – no class. Work on HW-1 and HW-2	
9/6	~~5~~	~~**Quiz 2** (on HW-2). Discuss TED lectures, solid waste generation and movie *Home*.~~ NO CLASS – Hurricane Irma	
9/11	~~6~~	NO CLASS – Hurricane Irma	~~1~~
9/13	~~7~~	NO CLASS – Hurricane Irma	
9/18	5	**Take home Quiz 2** due today (on HW-2). Wrap up mass and energy balance.	1
9/20	6	**Quiz 3** (on HW-2). Start chemistry review (HW-3: due 9/20)	2
9/25	7	Complete chemistry review. HW-3 solution discussion.	2
9/27	8	**Quiz 4** (on HW-3). Problem solving – chemistry.	2
10/2	9	Lab discussion: Acid-base reactions and alkalinity.	2, 5
10/4	10	**Quiz 5.** The 5-day BOD; acid-base titration (HW-4: due 10/18)	5
10/9	11	Review mass balance and chemistry; solutions for HW-2 and HW-3	1, 2
10/11	12	**First Midterm Exam (Chapters 1 & 2)**	
10/16	13	Return graded exams, review solutions for first midterm	
10/18	14	**Quiz 6.** Chapter 5: Water quality parameters – biodegradable organics = BOD. BOD exerted versus remaining	5
10/23	15	PFR versus CSTR; DO sag curve (PFR); Groundwater and Darcy's Law. **Makeup First Midterm Exam (Chapters 1 & 2) from 3:15 – 4:45 p.m.**	5
10/25	16	Chapter 5 example problems; HW-4 discussion	5
10/30	17	**Quiz 7.** Municipal water and wastewater treatment.	6
11/1	18	Municipal water and wastewater treatment.	6
11/6	19	**Quiz 8**. Municipal water and wastewater treatment. (HW-5: due 11/6)	6
11/8	20	**Quiz 9**. Municipal water and wastewater treatment. Examples	6

11/13	21	Municipal water and wastewater treatment. HW-5 discussion	6
11/15	22	Review exam on Chapters 5 & 6. Will also discuss solid waste management in preparation of our tour of the RRF	5, 6, 9
11/17		**Friday Field trip to Resource Recovery Facility (RRF) in Doral (attendance = Quiz 10)**	
11/20	23	**Second Midterm Exam (Chapters 5 & 6)**	
11/22	24	Air pollution – mass balance over air shed. (HW-6: due 11/22)	
11/27	25	**Quiz 11** (on HW-6). Kinetics of growth – demographics & resource consumption. (HW-7: due 11/29 – covers chapters 3 and 4)	7, 3
11/29	26	~~Risk Assessment.~~ **Fall 2017 Student Forum**	4
12/4	27	**Quiz 12** (on HW-7). Problem solving on Chapters 3 and 4	3, 4
12/6	28	Final review class	

ABET-related Objectives & Outcomes

This course accomplishes, to various extents, the following ABET-related objectives and outcomes. The outcome identifiers, herein used (e.g., "3h"), correspond to the same labelling system that is used in the ABET Criteria for Accrediting Engineering Programs (www.abet.org).

Objective 1 - Technical Proficiency: Our graduates will be able to:

- 3a. apply knowledge of mathematics, science, and engineering;
- 3e. identify, formulate, and solve engineering problems;
- 3k. use the techniques, skills, and modern scientific and engineering tools necessary for Civil/Environmental Engineering practice.

Objective 3 – Responsible Citizenship: Our graduates will be able to:

- 3h. understand the impact of engineering solutions in a global, economic, environmental, and societal context;
- 3j. demonstrate knowledge of contemporary issues.

Objective 5 – Ethical Behavior: Our graduates will have:

- 3f. An understanding of professional and ethical responsibility.

ENV 3001 addresses the following objectives and outcomes:
3a, 3e, 3k, 3h, 3j, and 3f.

Conversions you will need to be familiar with:

Although the entire world including Great Britain (a.k.a. the U.K.) has moved on to adopt the SI system of measurement (based on meters for length, kg for mass, °C for temperature, Joules or kJ for energy, etc.), engineers in the U.S. continue to be enamored of the old British units of measurement.

Through this and other courses you will need to be familiar with both sets of measurements.

- Appendix A of your textbook lists useful conversion factors.
- The Formula Sheet for ENV 3001 that I have uploaded onto Blackboard and attached with the syllabus – also lists some useful conversions.
- Table F.1 Formulas for Unit Conversions from the fluids textbook – also posted on Blackboard

Furthermore, be aware of really common conversions. For example,

1. Flow capacities for drinking water and wastewater treatment plants are generally listed in million gallons per day or MGD, e.g., the Preston Water Treatment in Hillsborough has a capacity of 160 MGD. What does this correspond to cubic meters per second or m^3/s? (Given 1 MGD = 0.0438125 m^3/s, the Preston Water Treatment Plant capacity is approximately 7 m^3/s)
2. The winter temperatures in much of the northern U.S. can reach –17 °C. What does that translate to in degrees Fahrenheit? And what does the balmy 80 °F enjoyed by southern Florida amount to in Celsius? (Given conversion formula $C = (F - 32) \times 5/9$; the northern temperatures are –17°F, and Miami's 80 °F corresponds to about 27 °C.)
3. Fuel heating values refer to the amount of energy released when burning a fuel. You will find units of Btu/lb (or Btu/gal) commonly used in the U.S. For example, methane has a heating value (HV) of approximately 1000 Btu/ft^3, gasoline has a HV of 125,000 Btu/gal, coal has HV of 12,500 Btu/lb, and pelletized lumber has HV of 16,000 Btu/lb. However, when you use thermodynamic data to compute the heat of combustion for methane in Examples 2.4 and 2.5 of your text, you report the HV as kJ/mol. How would you convert between one and the other?

Typical ENV 3001 Grading Scheme

Grade allocation	
Midterms	40
Final Exam	20
Quizzes (best eight)	40

Grade cutoffs (these may change a little):

>95	A
>90	A-
>85	B+
>80	B
>75	B-
>70	C+
>65	C
<65	D/F