Fall 2014 – CE 3541: Environmental Engineering Laboratory
3 Credits

Mondays, time TBD
Wednesdays, time TBD
location TBD

Fridays, time TBD
650 Civil Engineering

Instructor: Dr. Erin Surdo
Office: TBD Civil Engineering
Office Phone: TBD
Email: surdo001@umn.edu
Office Hours: TBD

TA: TBD
Office: TBD
Office Phone: TBD
Email: TBD
Office Hours: TBD

Course Description:
A laboratory-based course focused on physical, chemical, and microbiological measurements used in the analysis of air, water, and solid samples. Applications include water treatment, wastewater treatment, hazardous waste treatment/remediation, air pollution, and environmental sensing.

CE 3541 targets the following Student Learning Outcomes. In this course, you will:
- identify, define, and solve problems.
- locate and critically evaluate information.
- communicate effectively.

You will also meet the following ABET Criterion 3 Program Outcomes:
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.
(g) An ability to communicate effectively.
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Prerequisites:
- CE 3501: Introduction to Environmental Engineering
  A background in the concepts and strategies used in environmental engineering is required for the successful completion of this course.

Required Texts:
- CE 3541 Laboratory Manual
- Fundamentals of Environmental Engineering, by James R. Mihelcic
  This textbook provides a brief overview of the physical, chemical, and microbial processes that are used to understand environmental systems and treatment applications.

Recommended Texts:
- Introduction to Environmental Engineering and Science, 3rd Edition, by Masters and Ela
  This textbook is required for CE 3501 (the course prerequisite) and may help guide you through the environmental engineering applications of the basic processes and measurements we cover in CE 3541.

Role of the Instructor:
The University's policy regarding instructor responsibilities may be found at:
http://www.policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html
In addition, I view my role as instructor to:

- Facilitate Learning
  As the instructor of this course, it is my job to facilitate your progress toward achievement of the course objectives. I will facilitate learning by presenting the class with discussion topics and hands-on laboratory problems designed to help you develop a deeper understanding of course material.

- Be Honest and Fair
  I will do my best to be fair and open about student performance throughout the semester. If you have any questions about your performance or how it may be improved, please do not hesitate to approach me with your questions and concerns.

- Appreciate Diversity
  Diversity in backgrounds and ideas is important in every field. This is especially true in engineering, where the best solution to a problem may culminate from exposure to a variety of different academic backgrounds. I will try to promote open-mindedness to new ideas and reliance on diverse experiences throughout this course. If you have any further ideas about how I can improve in this area, please let me know.

  The University policy on equity and diversity can be viewed at:
  http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf

- Accommodate Student Disabilities
  Disability Services (http://diversity.umn.edu/disability/ or 612-626-1333) offers services to students with documented disabilities and will help me determine how to accommodate your needs in this course. Please contact me, Disability Services, or (preferably) both as soon as possible if services are needed.

  Mental health and stress management services are also available and can be accessed via:
  http://www.mentalhealth.umn.edu/

- Balance Academic Workload
  It is also my job to ensure that this course fits within guidelines established by the Department of Civil Engineering and by the University of Minnesota. The University's academic workload policy can be found at:
  http://www.policy.umn.edu/Policies/Education/Education/STUDENTWORK.html

- Promote Academic Freedom
  Academic freedom is the freedom to discuss matters relevant to the content of the course. You are free to disagree with matters of opinion presented in the course, but you are also ultimately responsible for learning the content presented. Within this context, it is my responsibility to ensure that ALL student opinions are heard and respected.

Role of the Student:
The University outlines student responsibilities in its teaching and learning policy:
http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html
In addition, I require that my students:

- Participate
  Labs and in-class discussion are intended to enhance your learning and retention of course material. They are also meant to be fun and to encourage discussion and the sharing of ideas. Much of your grade in this course is indirectly linked to participation, as these in-class experiences are designed to improve your ability to apply concepts covered in the course.

- Complete Major Assignments
  The quizzes, pre-lab assignments, and laboratory reports required for this course are designed to provide you with the opportunity to demonstrate your understanding of the course material. Completion of these assignments is essential to evaluate learning.

- Act Professionally
  - Proper Classroom Conduct
    Civility in the classroom is necessary to ensure a comfortable learning environment for all students. Disruptive and inappropriate behavior (including that associated with the use of personal electronic devices) is not acceptable. Students who interfere with their classmates' learning will be asked to leave. The official University policy on classroom conduct is available at:
    http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf

    Sexual harassment of any kind will not be tolerated and is prohibited by University policy. The official policy may be viewed at:
    http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf

  - Academic Honesty
    Cheating in this course is unacceptable. The University has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty:
    http://www.oscai.umn.edu/integrity/student/index.html

    Individual work (quizzes, laboratory reports) is expected to be completed independently. Anyone found cheating will earn a zero on the assignment, and students with recurring incidents of cheating will fail the course. **Plagiarism is considered cheating and will not be tolerated.** More information on plagiarism can be found at: http://owl.english.purdue.edu/owl/resource/589/1/

    Course materials, including notes taken during class, are available to help you and your classmates develop a deeper understanding of course material. Use of course notes and materials beyond the classroom (such as broad distribution or receipt of payment for course materials) will not be tolerated.

Major Assignments:

- Lab Reports (6) – 72%

  Lab reports are designed to evaluate your understanding of the usefulness of the experiment conducted, your interpretation of the data obtained, and your ability to communicate this understanding in professional written form. The proper format of lab reports will be discussed during the first week of class. Each lab report will be due a week and a half after the completion of the lab, as noted in the course schedule.
- Pre-Lab Assignments (12) – 12%

  Pre-lab assignments include the necessary background study and calculations required to design and implement a successful laboratory experiment. Pre-lab assignments are due each Friday before lab. You are encouraged to work on pre-lab assignments with your lab partner or with others in the class, but the assignment must represent your own work (and not a copy of your lab partner's work).
- Quizzes (4) – 16%

  Short-answer quizzes (20 minutes each) are closed-book/closed-notes and will cover reading and lecture material. See course schedule for quiz dates.

Grading:

- The University of Minnesota Senate document defining assigned grades can be found at: http://www.policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html
- Quantitative Grade Assignments:

A	=	93-100%	C	=	73-76%
A-	=	90-92%	C-	=	70-72%
B+	=	87-89%	D+	=	66-69%
B	=	83-86%	D	=	60-66%
B-	=	80-82%	F	=	<60%
C+	=	77-79%			

- Grade Distribution:

Lab Reports (6)	72%
Pre-Lab Assignments (12)	12%
Quizzes (4)	16%

- Missed Quizzes:

  Make-up quizzes will not be offered without prior instructor approval or a doctor's note.
- Late Assignments:

  Meeting deadlines is an important task that all practicing engineers will face on a regular basis. Late assignments will automatically loose 50% of their value and cannot be turned in for credit more than one week after the due date.
- University Policy:

  The University's policy on make-up work can be viewed at: http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html

Tentative Course Schedule (subject to change):

Topics	Reading	Lab
Week 1: September 3-5		
• Course Introduction • Keeping a Lab Notebook • Writing a Lab Report	Chapters 1 and 2	Class will meet in lecture room (TBD) on Friday, September 5.
Week 2: September 8-12		
• Statistics • Indoor and Outdoor Air Quality Parameters	Statistics Handout	Environmental Monitoring I: Air Quality Monitoring
Week 3: September 15-19		
• Water Quality Parameters • Field Sensing Equipment • Collection/Analysis of Large Data Sets	Statistics Handout	Environmental Monitoring II: Water Quality Monitoring/Field Sensing
Week 4: September 22-26 **Quiz 1 on Monday, September 22**		
• Activity vs. Concentration • Chemical Equilibrium • Alkalinity	Chapters 3.1, 3.3, and 3.4.2-3.4.3	Chemical Processes I: Ionic Strength, pH, and the Carbonate System
Week 5: September 29-October 3 **Environmental Monitoring Lab Report Due on Wednesday, October 1**		
• Solubility/Precipitation • Hardness	Chapter 3.4.4	Chemical Processes II: Solubility and Water Softening
Week 6: October 6-10		
• Turbidity • DLVO Theory • Stoke's Law	DLVO Handout Chapter 4.3.2	Solids Removal: Coagulation/Flocculation and Filtration for Surface Water Treatment
Week 7: October 13-17 **Quiz 2 on Monday, October 13** **Chemical Processes Lab Report Due on Wednesday, October 15**		
• Microbiology • Exponential Growth • Biological Markers for Tracking Environmental Contamination	Chapters 5.1 and 5.2	Biological Processes I: Microbiology and Water Quality
Week 8: October 20-24 **Solids Removal Lab Report Due on Wednesday, October 22**		
• Biological Wastewater Treatment • BOD/COD • Nutrient Removal	Chapters 3.2, 5.4, and 5.5	Biological Processes II: Wastewater Treatment
Week 9: October 27-31		
• Microbial Evolution in the Presence of Water Pollutants • Bioremediation		Biological Processes III: Bioremediation
Week 10: November 3-7 **Quiz 3 on Monday, November 3**		
• Introduction to Mass Transfer • Fick's Laws	Chapter 4.3.1	Physical Processes I: Diffusion

Week 11: November 10-14 **Biological Processes Lab Report Due on Wednesday, November 12**		
• Advection vs. Diffusion • Mixing/Turbulence • Mass Transfer Coefficients	Mass Transfer Handout	Physical Processes II: Mass Transfer Coefficients
Week 12: November 17-21		
• Mass Balances • Dynamic and Steady-State CMFR Theory	Chapter 4.1	Reactor Dynamics I: Completely Mixed Flow Reactors
Week 13: November 24-26 **Physical Processes Lab Report Due on Wednesday, November 26**		
• Dispersion		**Happy Thanksgiving!**
Week 14: December 1-5		
• Reaction-Mass Transfer Dynamics	Chapter 4.3.3	Reactor Dynamics II: Packed Columns
Week 15: December 8-10 **Quiz 4 on Monday, December 8**		
• Wrap-Up • Lab Clean-Up		
Reactor Dynamics Lab Report Due on Wednesday, December 17		