**Northeastern University**

**Department of Civil and Environmental Engineering**

Instructor’s Assessment

CIVE 4534 Environmental Engineering 2

**Semester / Year:** Spring / 2013 **Instructor: Larese-Casanova Date:** 05/10/2013

Expectations regarding this course assessment:

1. Before the start of the course, review the most recent instructor assessment for recommendations on how to improve the course.
2. Grade summaries will be based on midterm and final exam questions.
3. *Questions to be asked on the in-class evaluation:*  none.
4. This assessment form is based on the set of topics and learning outcomes listed in the course syllabus. Do not change this part of the syllabus without action from the discipline group. If there is a change, notify the Undergraduate Studies Committee so that this form can be modified.
5. Complete the form and save it as a Word document with filename like this: IAssess\_4534 \_2013\_Fall

**1. What course improvements did you make? How successful were they? Relate them to recommendations made in previous course assessments.** *Expand the table as necessary.*

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| --- | --- |
| 1. | Previous Recommendation: Include more in-class demonstrations of the physical, chemical, and biological phenomena. Action taken: I added one more laboratory exercise on aeration and demonstrated that in class. The experimental data well demonstrated the expected physical phenomenon. The lab exercise also required students to do in-class calculations (based on prior material in the general chemistry section), and they appreciated the time for reviewing those calculations. We need to acquire more resources (respirometer?) to demonstrate biological processes.  |
| 2. | Previous Recommendation: Revise lab exercise 1 to include more water quality measurements instead of focusing narrowly on buffer characterization. Action taken: I revised lab exercise 1 to include alkalinity determination in addition to the buffer characterization of the carbonate system. This experimental measurement of alkalinity was appreciated because it reinforced the material covered in lecture.  |
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**2. Your response to student comments and/or TRACE evaluation:** *Respond to serious criticisms and suggestions. Expand table as necessary.*

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|  | **Student Comment** | **Your Comment(s)** |
| 1. | Improve the quality of laboratory exercises | I would like to improve the laboratory exercises. Some labs were not conducted well enough due to lack of resources. We have acquired additional resources (equipment, glassware, meters) to make future lab exercises successful.  |
| 2. | More in-class demonstrations of physical and chemical phenomena related to water quality | I would indeed like to demonstrate more processes whose theory we discuss, but doing so is cumbersome in a classroom setting. Demonstrations would take complex, bulky equipment best suited for a laboratory. One solution would be to hold more laboratory demonstration sessions; however, the laboratory course (CIVE 4535) is only one credit hour, already occupied with four laboratory exercises. I recommend increasing the credit hours of CIVE 4535 and then scheduling more laboratory exercises or demonstrations.  |
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**3. Student questionnaire summary**

*Omit; does not apply.*

**4. Grade Summary**. Expand table as necessary. Midterm #1

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| --- | --- | --- | --- | --- |
| **Midterm exam question #** | **Topic** | **Average score** (0 to 100) | **% students with adequate achievement** | **Comment on any item with poor achievement** |
| M1-1. | COD | 89 | 95 |  |
| M1-2. | BOD | 97 | 100 |  |
| M1-3. | Concentration units | 83 | 89 |  |
| M1-4. | Chemical reactions | 92 | 100 |  |
| M1-5.  | Carbonate chemistry, alkalinity | 85 | 84 |  |
| M1-6.  | Organic acids, buffers | 92 | 89 |  |
|  |  |  |  |  |

Midterm #2

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| --- | --- | --- | --- | --- |
| **Midterm exam question #** | **Topic** | **Average score** (0 to 100) | **% students with adequate achievement** | **Comment on any item with poor achievement** |
| M2-1. | Reactor design | 100 | 100 |  |
| M2-2. | Sand filtration | 94 | 95 |  |
| M2-3a-e. | Particle settling | 92 | 100 |  |
| M2-3f-g. | Activated sludge | 89 | 84 |  |
| M2-3h-j. | Secondary clarification | 79 | 79 | A few students did not understand a graphical method for designing a secondary clarifier.  |

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| --- | --- | --- | --- | --- |
| **Final exam question #** | **Topic** | **Average score** (0 to 100) | **% students with adequate achievement** | **Comment on any item with poor achievement** |
| F1. | Reactor design | 99 | 100 |  |
| F2. | Sedimentation | 93 | 89 |  |
| F3. | Sand filtration | 75 | 74 | Students did not use overflow rate to answer the question. Rephrase the question to direct students to use this parameter.  |
| F4. | Water softening | 89 | 79 |  |
| F5. | Recarbonation | 22 | 42 | Students did not recognize that carbon dioxide gas is a weak acid that lowers solution pH. Need to reinforce this point in lecture using a lab demonstration (point was discussed many times in lectures).  |
| F6. | Disinfection | 89 | 95 |  |
| F7. | Activated sludge | 72 | 84 | Some students could not perform the design of a sludge basin, despite their bringing notes and equations of the process to the exam. |
| F8. | Aeration | 57 | 79 | Students did not recall the link between substrate COD and molecular oxygen provided during aeration.  |
| F9. | Retention times | 89 | 84 |  |
| F10. | Plant design | 89 | 84 |  |
| F11. | Sorption | 89 | 84 |  |

**5. Here are the topics listed on your syllabus.** Based on your grade summaries, report the fraction of students that showed ability to apply knowledge and to identify, formulate, and solve problems. In the column “Basis for assessment” report the particular item(s) in the grade summary that support this assessment; or if the topic is not covered in the grade summary, state the basis of your assessment.

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| --- | --- | --- | --- |
| **Topic / Learning Outcome** | **Percentage of students showing ability to apply knowledge and solve problems** | **Basis for assessment** | **Comments** |
| 1. *Water quantity & quality*
 | 85 | Grade Summary #M1-1 to M1-6. Homeworks. | Some students had difficulty understanding the water chemistry material in early homeworks.  |
| 1. *Analytical methods for water quality management*
 | 90 | Grade Summary # M1-1, M1-2, M1-5. Laboratory exercises 1, 2, 3, 4 and their accompanying reports.  | Overall positive learning for most students, but some students simply didn’t participate well enough and therefore learned little.  |
| 1. *Physical phenomena and treatment*
 | 90 | Grade Summary #M2-1 to M2-3, F1 to F3. homeworks.  | Some students did not turn in assignments or did not put in the effort in this section.  |
| 1. *Chemical phenomena and treatment*
 | 85 | Grade Summary #F1, F5, F6, F11. Homeworks.  | Student learning was not too high at first, but with repeated addressing the chemistry and kinetics topics, learning improved |
| 1. *Biological phenomena and treatment*
 | 85 | Grade Summary #M2-3, F7, F8, F9, F10 | This section contained very detailed math and microbiology, and some students did not catch on.  |
| 1. *Laboratory experiments*
 | 95 | Laboratory exercises 1, 2, 3, 4 and their accompanying reports.  | Overall student learning was very good, but some students struggled explaining what they did within laboratory reports.  |

**6. Assessment of Program-Level Outcomes not Covered in Topic Assessment**

What percentage of students achieved the following learning outcomes?

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| --- | --- | --- | --- |
| **Learning Outcome** | **Percentage achieving** | **Basis for this rating**  | **Comments?** |
| an ability to design and conduct civil engineering experiments, as well as to analyze and interpret data | 85 | Laboratory exercises 1, 2, 3, 4, and their accompanying reports.  | Most students took the experiments and reporting very seriously, but some put in insufficient effort. Some students simply did not participate in the lab exercises.  |
| an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability | 90 | Grade Summary, # M2-1 through M2-3, F2 through F11. Homeworks.  | All problems considered environmental and practical constraints; some considered economic constraints. Can be improved by adding system-wide treatment designs that consider sustainable constraints as well.  |
| an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice | 85 | Laboratory reports. Homeworks. Grade Summary, #M2-1 to M2-3. Software.  | Percentage of students demonstrating learning here can be improved with additional laboratory resources and exercises.  |

**7. Recommendations for improving this course.** Expand the table as needed.

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| 1. | Create a learning module on a simple design and modeling of an entire water treatment plant with multiple unit operations. Students should apply the flow balances and mass balance equations to determine the general operating parameters (flow rates to each process, chemical dosing to each process, volume of each basin, residence time in each basin) of an entire plant. This module should be taught at the end of the semester as a summary lesson.  |
| 2. | Expand this course to 4 credits. I already assign 16 homeworks, two mid-term exams, and one final exam. This workload seems high enough for 4 credits.  |
| 3. | Expand the companion course, CIVE 4535, to 3 or 4 credits (from 1 credit) and perform additional laboratory exercises such as solids analysis in a wastewater treatment plant, biochemical oxygen demand, chemical oxygen demand, enzyme kinetics, chlorination, environmental sampling & analysis, hardness.  |
| 4.  | Improve the laboratory exercises by acquiring more resources, making students perform work in smaller groups, and splitting the class into two lab sessions that meet on different days to achieve smaller groups.  |
| 5.  | Review each learning module, streamline the background science information (some may be lengthy), and add some more example problems.  |
| 6.  | Provide final answers (not necessarily full solutions) to more homework problems so students can check if they are doing the problems correctly prior to handing in the assignment. Also provide full solutions to problems at the end of chapters in the textbook so students can learn from them.  |
| 7. | During the review of the course, review and stress the most important topics: kinetics, reactor design, alkalinity, COD, BOD, overflow rate, basin sizing, mass balances, flow balances.  |
| 8.  | Remove the aeration homework assignment because it is identical to the aeration laboratory exercise.  |