Course CIV_ENV 365-0: Environmental Laboratory, Winter 2011

Credits: 1 unit credit; contact hours: 4 hrs lab experiments; 5 hrs lab/project report per week
Instructor: Yun Wang

Other Materials: Laboratory description handouts, sample lab reports, websites, power point documents, etc.

Description: This course will provide students with hands on experience in chemical analysis for assessing water quality issues (with specific goals and program outcomes outlined below).

Prerequisites: CIV_ENV 367
Required (?): Required

Specific Goals for the Course:
1. to learn basic chemistry laboratory skills used by environmental engineers for assessing the chemical quality of a water sample;
2. to learn how to determine concentration of key chemical species;
3. to be able to plan and conduct an experiment;
4. to be able to effectively report, analyze and interpret laboratory results.

Program Outcomes as Defined for ABET That Are Directly Related to This Course:
a. an ability to apply knowledge of mathematics, science, and engineering (including biological and chemical science);
b. an ability to design and conduct experiments as well as to analyze and interpret data in one focus area (water);
f. an understanding of professional and ethical responsibility;
g. an ability to communicate effectively;
k. an ability to use the techniques, skills, and modern scientific tools necessary for engineering practice, including concepts of professional practice.

<table>
<thead>
<tr>
<th>Course Goals</th>
<th>Outcome</th>
<th>Performance Indicator</th>
<th>Assessment</th>
<th>Proposed Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3, 4</td>
<td>a</td>
<td>Final project report</td>
<td>91% / 100%</td>
<td>None</td>
</tr>
<tr>
<td>2, 3, 4</td>
<td>b</td>
<td>Final project; results and discussion sections in lab and final project reports</td>
<td>84% /100%</td>
<td>A lecture on statistical analysis in the beginning of the class.</td>
</tr>
<tr>
<td>3, 4</td>
<td>f</td>
<td>Lab notebooks</td>
<td>100% / 100%</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>g</td>
<td>Writing format in lab reports and final project reports</td>
<td>100% / 100%</td>
<td>None</td>
</tr>
<tr>
<td>1, 2, 3, 4</td>
<td>k</td>
<td>Ability to use instruments</td>
<td>100% / 100%</td>
<td>None</td>
</tr>
</tbody>
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Topics Covered:

List of Experiments

A set of 7 experiments will be performed in the first weeks.

- The first experiment – pH determination is performed by all on the first week of class.
- The next 6 experiments will be performed each week on a rotation basis that will be established in the first day of class.
- The last 3 weeks of the quarter will consist in designing a suite of measurement to diagnostic the chemical changes that occurs to the original water samples that were analyzed on the weeks before.

1. **pH**: Determination of pH using a glass electrode - all in the lab week #1
2. **Alkalinity**: Introduction to computerized titration methods
3. **Hardness and TOTCa**: Flame Atomic Absorption Spectroscopy and EDTA titration
4. **TOTNa and TOTK**: by Flame Emission Spectroscopy
5. **Dissolved O₂**: Winkler titration, O₂ probe, and determining - $\Delta H^0_R$
6. **TOTCl and TOTSO₄**: Cl⁻ by argentometry, SO₄²⁻ by gravimetry and indirect titration
7. **$\sum$PO₄ and $\sum$NH₃**: Spectrophotometric methods: Soluble Reactive Phosphorus (SRP) and Ammonium by colorimetry
8. **Experiments**: Weeks 8, 9 & 10 will be dedicated to completing previous experiments and looking at the influence of degassing and varying pCO₂ on the chemistry of surface waters of Lake Michigan.

Grade Distribution: Lab reports (60%), lab notebooks (10%), and Final project report (30%)

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