Course:  
\textit{CIV\_ENV 365-0: Environmental Laboratory, Winter 2017}

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

Instructor:  
Yun Wang

Recommended

(1) Laboratory Manual
(2) \textit{Analytical Chemistry} 2.1 ebook by Prof. David Harvey
(3) Instrument Protocols
(4) \textit{Detailed Theoretical Guidelines for Various Techniques covered by This Class}

Other:

Materials:  
Laboratory description handouts, 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:

\textbf{a.} an ability to apply knowledge of mathematics, science, and engineering (including biological and chemical science);

\textbf{b.} an ability to design and conduct experiments as well as to analyze and interpret data in one focus area (water);

\textbf{f.} an understanding of professional and ethical responsibility;

\textbf{g.} an ability to communicate effectively;

\textbf{k.} an ability to use the techniques, skills, and modern scientific tools necessary for engineering practice, including concepts of professional practice.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|}
\hline
Course Goals & Outcome & Performance Indicator & Assessment & Proposed Action \\
\hline
1, 2, 3, 4 & a & Revised lab report & 88\% / 100\% & None \\
\hline
2, 3, 4 & b & Results and discussion sections in lab reports & 83\% /100\% & A lecture on statistical analysis in the beginning of the class. \\
\hline
3, 4 & f & Lab notebooks & 100\% / 100\% & None \\
\hline
4 & g & Writing format in lab reports & 100\% / 100\% & None \\
\hline
1, 2, 3, 4 & k & Ability to use instruments & 100\% / 100\% & None \\
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\end{table}
Topics Covered:

List of Experiments

A set of 9 experiments will be performed in this class (Students are required to submit laboratory reports for the first 8 experiments listed below). The first experiment – pH determination is performed by all on the first week of class – the next 8 experiments will be performed each week on a rotation basis.

1. **pH**: Determination of pH using a glass electrode – all in the lab week #1–
2. **Alkalinity**: Introduction to computerized titration methods
3. **Hardness, Ca and Mg**: by EDTA titration and flame atomic absorption spectroscopy, respectively
4. **Na, K, and Li**: by Flame emission spectroscopy
5. **Phosphate and Nitrate**: by colorimetry and second-derivative adsorption ultraviolet (UV) spectroscopy, respectively
6. **Major and Minor Anions**: by ion chromatography
7. **The Trace Metal Cu**: by graphite furnace atomic absorption spectroscopy
8. **Dissolved Organic Carbon**: by high temperature combustion
9. **The Organic Contaminant Triclosan**: by high performance liquid chromatography

Grade Distribution: Lab reports (90%) and lab notebooks (10%)

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