### Course Information

**Department:** Environmental and Ecological Engineering  
**Effective Session:** Fall 2014  
**Course Number:** EEE 36000

### Proposed Course Details
- **Subject Abbreviation:** EEE
- **Course Title:** Environmental and Ecological Engineering Laboratory
- **Short Title:** Env & Ecol Engr Lab

### Credit Type
- **1. Fixed Credit or Hrs.:**
- **2. Variable Credit Range:**
  - **Minimum Cr. Hrs:**
  - **Maximum Cr. Hrs:**
  - **Equivalent Credit:** Yes

### Schedule Type
- **Lecture:** U-11U
- **Recitation:**
- **Presentation:**
- **Laboratory:** U-17U
- **Lab Prep:**
- **Studio:**
- **Distance:**
- **Clinic:**
- **Experiential:**
- **Research:**
- **Ind. Study:**
- **Prac/Observ:**

### Course Attributes
- **1. Pass/No Pass Only**
- **2. Satisfactory/Unsatisfactory Only**
- **3. Repeatable**
- **Maximum Repeatable Credit:**
- **4. Credit by Examination**
- **9. Full Time Privilege**
- **10. Off Campus Experience**

### Course Description
An introduction to laboratory methods of analysis of Environmental and Ecological Engineering systems. Topics will change from semester to semester and will be announced in advance. The list of possible topics includes experimental design, treatment of data, the analytical determination of chemical and biological constituents in water, soil and air; analysis of environmental and ecologi-cal engineering processes; and analysis of life-cycle characteristics and impacts of consumer products and commodities; methods of prevention and remediation of manufacturing waste streams. Pre-requisites: CHM 11200 or CHM 11600 or CHM 13600.

### Course Learning Outcomes
1. An ability to acquire experimental data and evaluate experimental error and variability
2. An understanding of data reduction, analysis and presentation
3. An ability to produce professional technical communication of experimental conclusions
4. An ability to summarize results of quantitative analysis to propose management strategies for environmental problems.

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**Signature:**

- **Office of the Registrar:**
- **Received:** FEB 0 4 2014
- **2015-0**

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**Additional Information:**

- **Office of the Registrar:**
- **Date:** 11/18/13
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TO: The Faculty of the College of Engineering
FROM: The Division of Environmental and Ecological Engineering
SUBJECT: New Undergraduate Course, EEE 36000, Environmental and Ecological Engineering Laboratory

The Faculty of the Division of Environmental and Ecological Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

EEE 36000: Environmental and Ecological Engineering Laboratory
Sem. 1, 2, Lecture 0-2, Laboratory 2-6, Credits 1-3
Pre-requisites: CHM 11200 or CHM 11600 or CHM 13600.

Course description:
An introduction to laboratory methods of analysis of Environmental and Ecological Engineering systems. Topics will change from semester to semester and will be announced in advance. The list of possible topics includes experimental design, treatment of data, the analytical determination of chemical and biological constituents in water, soil and air; analysis of environmental and ecological engineering processes; and analysis of life-cycle characteristics and impacts of consumer products and commodities; methods of prevention and remediation of manufacturing waste streams.

Reasons:
This variable-credit laboratory course is planned as a core course in the Environmental and Ecological Engineering undergraduate curriculum. Laboratory experience is a foundational component of Environmental and Ecological Engineering professional preparation. Students will typically take this course during their sophomore or junior year. Students will be required to complete a minimum of 3 credits of this course to earn the BSEE degree. Students who complete unique laboratory experiences in excess of 3 credits will be allowed to count the credits as EEE Selectives.

Course Attributes: Variable Title

Repeatable for Additional Credit: Yes – May be repeated for up to 9 credits

John W. Sutherland, Head
Division of Environmental and Ecological Engineering

[Signature]

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE

ECC Minutes 1/28/14
Date 1/28/14
Chairman ECC
EEE 36000: Environmental and Ecological Engineering Laboratory (EFD 11-14)

Level: Undergraduate

Potential Topics:

- **EEE Laboratory Skills**
  Design of Experiments
  Statistical Analysis of Data
  Propagation of Error
  Technical Writing

- **Environmental Chemistry**
  pH Measurement, Acid-Base Titrations, Alkalinity
  UV/Vis Spectroscopy, Buffer Design, pKa Determination
  Ion Selective electrodes, ion activity
  Ca²⁺ and Mg²⁺ Measurement by EDTA Chelation/Titration
  Chlorine Analysis by DPD Titration
  Chemical Oxygen Demand (COD)
  Dissolved Oxygen Measurement

- **Environmental Microbiology**
  E. Coli Measurement and Disinfection
  Membrane Filtration for total Fecal Coliform Bacteria
  Biochemical Oxygen Demand (BOD)
  Microbial Growth Kinetics
  Microbial Decay of Pollutants
  Nitrification/Denitrification Reactions
  Biofilms

- **Environmental Processes**
  Completely Mixed Systems in Series
  Alum Coagulation, Turbidity
  Lime softening, settling and Stoke's Law
  First Order Decay
  Ion Exchange (Cu²⁺ – Na⁺)
  Henry's Law (O₂ solubility with temperature)
  Contaminant Transport in Porous Media
  Adsorption of Pesticides to Soils

- **Environmental Sustainability and Life Cycle Assessment**
  EEE Impacts of Adhesives
  Fasteners and Disassembly
  Recycling of Composites and Mixed Material Systems
  Sensors for Remanufacturing Assessment
  Alloys and Secondary Supply Chains
  Quantifiable Material Carbon/Water/Energy Footprints
  Materials Flow Analysis
  Energy and Water Transport/Drying
  Industrial energy measurement
  Assembly and disassembly of mechanical/electromechanical/electronic products
  Materials testing/characterization
Course Objectives:

Students successfully completing the Environmental and Ecological Engineering Laboratory will demonstrate:
1. An ability to acquire experimental data and evaluate experimental error and variability
2. An understanding of data reduction, analysis and presentation
3. An ability to produce professional technical communication of experimental conclusions
4. An ability to summarize results of quantitative analysis to propose management strategies for environmental problems.

Textbooks and readings:

There is no textbook for this course. Readings will be compiled from peer-reviewed literature and custom written lab manuals.

Grading:
Participation - 15%
Lab Reports - 85%

Previous Teaching:
This course was first offered for 3 credits in Fall 2013 as EEE 495.