SYLLABUS

1. **Number and Name: 11:117:423 – BIOENVIRONMENTAL ENGINEERING UNIT PROCESSES LAB I**

2. **Credits and contact hours:** 1 credit, one 180 minute laboratory period per week

3. **Instructor**: Weilin Huang

4. **Text:** Handouts prepared based on AEESP Laboratory Manual
   Reference: *AEESP Laboratory Manual*

5. **Specific Course Information**

   a. **Catalog Description:** *Demonstration of physicochemical processes and operations used in drinking water and wastewater treatment, including reactor design and residence time distribution, coagulation, flocculation, sedimentation, filtration, carbon adsorption, chemical oxidation, and oxygen transfer.*

   b. **Co-requisites:** 11:117:413

   c. **Course Type:** Required

6. **Course Goals**

   a. **Specific Instructional Outcomes:** Learn laboratory techniques for characterizing and quantifying major physicochemical processes commonly used for water and wastewater treatment

   b. **Specific Student Outcomes addressed by the course include:**
   b. Ability to design and conduct experiments as well as to analyze and interpret data
   Instructional Activity: Successful completion of laboratory demonstration and laboratory measurements focused on physicochemical processes for drinking water and wastewater treatment
   Assessment Activity: Individual grading of student assignments on acquisition, reduction, presentation, and interpretation of data in scheduled experiments focused on water treatment unit processes for removal of different types of pollutants
   g. Ability to communicate effectively
   Instructional Activity: Successful completion of design- and laboratory- related assignments and laboratory reports focused on physicochemical processes for drinking water and wastewater treatment
   Assessment Activity: Individual grading of design- and laboratory- related assignments and laboratory reports focused on physicochemical processes for drinking water and wastewater treatment

k. Ability to use techniques, skills and modern engineering tools necessary for engineering practice
Instructional Activity: Successful completion of design- and laboratory- related assignments and laboratory reports focused on physicochemical processes for drinking water and wastewater treatment
Assessment Activity: Individual grading of student projects and assignments

7. Topics

1 Introduction to statistical analysis for process characterization and measurements

2 Completely mixed flow reactor (CMFR): Tracer test and residence time distribution analysis

3 Plug flow reactor (PFR): Tracer test and residence time distribution analysis

4 Coagulation and flocculation: Double layer compression, coagulants and coagulation, flocculation

5 Granular activated carbon adsorption (1): GAC and properties, batch reactor preparation, adsorption, isotherm, single solute (phenol) adsorption isotherm

6 Granular activated carbon adsorption (2): High performance liquid chromatography (HPLC), phenol analysis with HPLC

7 Granular activated carbon adsorption (3): HPLC data reduction and statistical analysis (Systat System), graphical presentation of adsorption isotherm (Sigma Plot), design question and lab report

Grading:	Attendance (plus pre-lab quizzes)	20%
	Data reduction and analysis	20%
	Design questions	20%
	Full length project report (1)	40%

Prepared by: Weilin Huang 04/12/2018