SYLLABUS

1. **Number and Name: 11:117:424 – BIOENVIRONMENTAL ENGINEERING UNIT PROCESSES LABORATORY II**

2. **Credits and contact hours:** 1 credit, one 180 min. laboratory period per week and one voluntary field trip to wastewater treatment facility

3. **Instructor:** Valdis Krumins

4. **Text:** Suggested text: *Environmental Biotechnology: Principles and Applications*, B.E. Rittmann and P.L. McCarty, McGraw-Hill, 2001
   Other supplemental materials:
   selected current scientific papers; Standard Methods; regulatory guidance documents

5. **Specific Course Information**
   a. **Catalog Description:** *Demonstration and investigation of biological processes used in the treatment of wastewater, including: natural biological processes in biotreatment ponds; biodegradability and biodegradation kinetics; activated sludge reactors; anaerobic digestion for bioenergy production; use of laboratory methods and analytical equipment to assess biological processes; and introduction to activated sludge simulation software.*
   b. **Prerequisites:** Prerequisites: 01:160:171, 01:160:211
      Co-requisite: 11:117:414
   c. **Course Type:** Required

6. **Course Goals**
   a. **Specific Instructional Outcomes:** Students will gain an understanding of the principles governing biological unit processes applied to wastewater treatment, bioenergy production and bioremediation. Students will learn to analyze and interpret data they collect from laboratory experiments. Students will utilize relevant data to evaluate the nature and potential of biological processes and for determination of design parameters. Research and communication skills will be gained through team-based and independent study project reports.

   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 three group or individual laboratory projects that involve the design of experiments and collection and analysis of a variety of data. Students individually or as a group submit reports detailing the experimental projects and their outcomes. A sheet detailing expectations of what should be presented in the report is provided.
   Assessment Activity: Students individually or as a group submit reports detailing the experimental projects and their outcomes. The instructor grades reports for conceptual

understanding and clarity of presentation of explanation of methods used, data analysis and data interpretation. The material is reviewed in class.

g. Ability to communicate effectively

Instructional Activity: Each student submits three reports on laboratory or field experiments including bioremediation of petroleum contaminated soil, anaerobic digestion, on the status of water quality in Passion Puddle Ponds, a small water body on campus. Revised reports will be submitted after input from the TA and instructor. A grading scheme and example report will be provided.

Assessment Activity: A grading scheme is employed by the instructor to give a points total to each student for the report and poster. Effective data analysis, writing, communication and use of graphics are part of the rubric that is used in the evaluation.

k. Ability to use techniques, skills and modern engineering tools necessary for engineering practice Instructional Activity: Successful completion of 3 laboratory projects that involve the design of experiments and collection and analysis of a variety of data. Students are instructed on the use of gas chromatography, wet chemical analysis techniques, microbial enumeration techniques, and techniques and methods for the reduction, analysis and manipulation of data.

Assessment Activity: Students individually or as a group submit reports detailing the experimental projects and their outcomes. The instructor grades reports and corrects errors in grammar, report format, explanation of methods utilized, data analysis and data interpretation. If reports show evidence of a lack of understanding of the methods used or interpretation of the data, the material is reviewed in class. Since the class is small, the instructor and TA also spend time individually with each student to assess their ability to use the analytical techniques and to correct any mistakes in methodology on a real-time basis.

7. Topics:

Bioremediation of petroleum contaminated soil
Waste stabilization and energy production through anaerobic digestion
Water Quality Measurements: BOD, COD, P, nitrate, turbidity, and microbial content
Microbial Growth Kinetics
Reactor Mass Balances and Microbial Growth
Data analysis – nonlinear curvefitting to obtain microbial kinetic parameters

Grading: Three lab reports (25% each)
Weekly quizzes on readings (10%)
Lab notes (5%)
Class and field trip participation (5%)

Prepared by: Valdis Krumins 05/23/17