ABE 5707C- AGRICULTURAL WASTE MANAGEMENT

1. **Catalog Description:** The course will introduce biological processes employed for treatment of agricultural, municipal, industrial and agro-processing residues and wastes. It will include biological, physical and chemical principles related to characterization and analysis of pollutants, biological and physico-chemical transformation of pollutants, and engineering principles for design and operation of treatment systems. The course will focus on analysis and design of activated sludge, nutrient removal, and anaerobic digestion systems. Field trips to operating systems will reinforce the concepts taught during lecture. 3 credits (Spring)

2. **Pre-requisites and Co-requisites:** 4 or higher classification courses in Biological, Chemical or Environmental Engineering

3. **Course Objectives:**
   The objectives of the course are to develop principles and concepts related to biological transformations of organic compounds and apply these to the design and operation of activated sludge, nutrient removal and anaerobic digestion systems. Specific objectives are to:
   - Learn about laboratory techniques for measuring dry matter, volatile matter, ash, carbonaceous, nitrogenous and phosphorous compounds in wastes and wastewater.
   - Develop stoichiometry of biological reactions
   - Quantify the kinetics of microbial transformations
   - Understand the principles of bioreactor design and operation
   - Characterize the processes occurring in activated sludge, nutrient removal, and anaerobic digestion systems
   - Design activated sludge and nutrient removal bioreactors for wastewater treatment
   - Design and understand operation of anaerobic digesters for wastewater and solid waste treatment
   - Learn about biogas cleanup and utilization
   - Analyze economics of anaerobic digestion processes

4. **Instructor:** Dr. Pratap Pullammanappallil
   a. Office location: 203 Rogers Hall
   b. Telephone: 352-294-6719
   c. E-mail address: pcpratap@ufl.edu
   d. Web site: Canvas
   e. Office hours: Before or after class on MWF or by appointment

5. **Teaching Assistant:**
   a. Office location:
   b. Telephone:
   c. E-mail address:
   d. Office hours:

6. **Meeting Times:** Monday, Wednesday, Friday 12:50 to 1:40 PM

7. **Class/Laboratory Schedule:** 3 hours a week

8. **Meeting location:** Rogers 211

9. **Material and Supply Fees:** $50

10. Textbook:

None

11. Recommended Reading:

a) Environmental Biotechnology- Principles and Applications
Bruce E. Rittman and Perry L. McCarty, 2001
ISBN: 0072345535

b) Agricultural Waste Management – Field Handbook
Accessed from
"http://www.wsi.nrcs.usda.gov/products/W2Q/AWM/handbk.html"
Or http://policy.nrcs.usda.gov/viewerFS.aspx?hid=21430

c) Industrial Water Pollution Control
W. Wesley Eckenfelder, Jr.
McGraw Hill

d) Wastewater Engineering: Treatment and Reuse
George Tchobanoglous, Franklin Burton, David Stensel
Metcalf and Eddy

12. Course Outline:

CHARACTERIZATION AND ANALYSIS OF WASTES

- Proximate Analysis
- Organic compounds
- Nutrients (nitrogen and phosphorous)
- Microbial pathogens
- Heavy metals

BIOLOGICAL WASTE TREATMENT

- Introduction
- Stoichiometry
- Microbial kinetics
- Biofilm kinetics
- Bioreactor design and modes of operation

BIOLOGICAL WASTEWATER TREATMENT SYSTEMS

- Activated Sludge Process
- Nitrification/Denitrification systems
- Phosphorous Removal

ANAEROBIC DIGESTION

- Introduction
- Microbial processes
- Types of anaerobic digesters
- Operating considerations
- Design of anaerobic digesters
- Biogas cleanup
- Economics of anaerobic digestion

13. **Attendance and Expectations:** Attendance at all lectures is expected from all students at all times.

14. **Grading:**

Exam #1	20%
Exam #2	20%
Exam #3	20%
Exam #4	20%
Field trip report	20%

15. **Grading Scale: A** (93-100%), **A**$^{-}$ (88-92%), **B**$^{+}$ (83-87%), **B** (77-82%), **B**$^{-}$ (71 -76%), **C**$^{+}$ (65 – 70%), **C** (58-64%), **C**$^{-}$ (50-57%) **D**$^{+}$ (40 – 49%), **E** (< 40%)

16. **Make-up Exam Policy:** No make-up exams will be given except for valid medical reasons or unless prior arrangements have been made.

17. **Honesty Policy** – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

18. **Course Evaluation** –Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

19. **Accommodation for Students with Disabilities** – Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

20. **UF Counseling Services** – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
    - University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
    - SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
    - Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
    - Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

21. **Software Use** – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.