Engineering Faculty Document No. 20-23
December 2, 2022

TO: The Faculty of the College of Engineering
FROM: The Division of Environmental and Ecological Engineering
SUBJECT: New Graduate Course, EEE 55201 Environmental Biotechnology and cross-list with CE 55201 Environmental Biotechnology

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 55201: Environmental Biotechnology
Sem. 2, Lecture 3, Credits 3
Prerequisites: CE/EEE 35000 or CE/EEE 45600 or a previous course in microbiology or biochemistry

Course description:
This course focuses on fundamentals of molecular biology and biotechnology for environmental applications. The major topics include activated sludge processes, stoichiometry, kinetics, anaerobic digestion, biological nitrogen and phosphorus removal, emerging contaminants, molecular microbiology tools, biofouling, antibiotic resistance, and biofuels.

This course has been taught has CE 59700, Environmental Biotechnology every Spring semester since 2015 with the exception of 2018.

Reasons: A permanent course number is being requested.

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

EEE 55201: Environmental Biotechnology (EFD 20-23)

Level: Graduate

Course Instructor: Zhi (George) Zhou

Course Description
Modern biotechnologies have been widely used in clinical diagnosis, food production, and pharmaceutical industry. Their applications in wastewater treatment have greatly improved the accuracy and efficiency of characterizing biological systems in biological wastewater treatment plants and the natural environment. This course is designed for graduate students who would like to learn modern biotechnologies in wastewater treatment and how to apply these biotechnologies to understand, characterize, and optimize wastewater treatment systems and plants. At the end of the course, students are expected to understand modern biotechnologies and their applications in wastewater treatment, select appropriate biotechniques to understand, characterize, and optimize wastewater treatment systems, under the application modern molecular microbiology tools for nutrient removal and energy recovery, and assess public health risks associated with antibiotic resistant bacteria and viruses in wastewater.

Learning Outcomes & Learning Objectives
Upon successful completion of the course, the students should be able to:

1. Understand the latest development in environmental biotechnology and their applications in contaminant removal and public health protection
2. Critically review relevant literature on selected topics in environmental biotechnology and identify areas for improvement
3. Deliver effective presentations
4. Write clearly and ethically

Previous Teaching:
This course has been taught as CE 59700, Environmental Biotechnology every Spring semester since 2015 with the exception of 2018.

Enrollment Spring 2019 = 10, 8 EEE students
Enrollment Spring 2020 = 9, 7 EEE students
Enrollment Spring 2021 = 5, 2 EEE students
Enrollment Spring 2022 = 13, 8 EEE students

The syllabus for Spring 2022 follows.

CE 55201/EEE 55201
ENVIRONMENTAL BIOTECHNOLOGY

INSTRUCTOR

Name: Associate Professor Zhi (George) Zhou, Ph.D., P.E., BCEE, ENV SP
Contact information: zhizhou@purdue.edu, telephone: (765) 496-3559, office: HAMP 2125

COURSE INFORMATION

Semester: Spring 2022
Prerequisite: CE35000 (Environmental Engineering), or CE45600/EEE45600 (Wastewater Treatment Processes) with a minimum Grade of D-, or a previous course on microbiology or biochemistry.
Time and Location: Mondays, Wednesdays, and Fridays from 10:30 to 11:20 am in HAMP 2113.
Office hours: Office hours will be available upon request. You are welcome to call or email me directly.

Recommended Textbooks

- *Environmental Biotechnology: Principles and Applications* by Bruce E. Rittmann and Perry L. McCarty, McGraw-Hill, 2020
- *Wastewater Microbiology* by Gabriel Bitton, Wiley-Liss, 2005
- *The Selfish Gene* by Richard Dawkins, Oxford University Press, 2006

Aims and Objectives

This course focuses on fundamentals of molecular biology and biotechnology for environmental applications. The major topics include activated sludge processes, stoichiometry, kinetics, anaerobic digestion, biological nitrogen and phosphorus removal, emerging contaminants, molecular microbiology tools, biofouling, antibiotic resistance, and biofuels.

Student Learning Outcomes

Upon successful completion of the course, the students should be able to:

1) Understand the latest development in environmental biotechnology and their applications in contaminant removal and public health protection
2) Critically review relevant literature on selected topics in environmental biotechnology and identify areas for improvement
3) Deliver effective presentations
4) Write clearly and ethically

Teaching Modes

Teaching modes will encompass 1) power point presentations, 2) tutorials & interactive discussion, 3) animations and video materials, and 4) contemporary aspects of environmental biotechnology.

COURSE POLICIES

General Policy

Students should follow regulations specified in http://www.purdue.edu/studentregulations/student_conduct/index.html.

Academic integrity

Cheating, fabrication, and plagiarism are **strictly prohibited** and can lead to zero in an assignment or other disciplinary actions. If you have any questions about literature review or report writing, please always ask me. A guide on academic integrity can be found in the following website: https://www.purdue.edu/odos/academic-integrity/

Students with disabilities or special needs

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

Expectations of performance behaviors

You are expected actively participate in group discussions and other activities. If you have any questions during the class, please feel free to ask. Cell phones and other irrelevant communicating equipment should be switched to silence mode before class to minimize distractions to other students.

Attendance

Your attendance of course lectures is required. If you cannot attend a certain class, please let me know as soon as possible.

Late policy

You are required to submit all assignments on the due dates. If you cannot submit a certain assignment on time, please contact me BEFORE the due dates. After the due dates, you will have to provide supporting evidences for medical/family/personal emergencies that prevent you from submitting assignments in time. If no request is put in advance or no evidence is provided, there will be a 10% penalty per day (including weekends) for late submissions.

ASSIGNMENTS AND GRADING

Course assessment will comprise:

Muddiest point:	10%
Homework:	30%
Project:	60%

Muddiest point is a one-sentence feedback for developing reciprocity between students and the lecturer. Muddiest point will help you identify an area that needs more explanations and provide a chance for you to ask a short question or make a suggestion. All questions, suggestions, or ideas are welcome. Muddiest points are collected during the class. Full scores will be given as long as you submit the muddiest points. Homework and project assignment are used to evaluate your understanding of the course contents and their application.

COURSE CONTENT

The following topics will be covered in this course:

Week	Topic
1	Course Overview & Introduction of Microbiology
	Activated Sludge Treatment Processes
	Activated Sludge Process - Stoichiometry
2	Anaerobic Digestion
	Nutrient Removal –Anammox and EBPR
	Critical Review of Journal Papers
3	Molecular Microbiology Tools
	Molecular Microbiology Tools
	Emerging Contaminants/EDCs/PPCPs
4	Membrane, Biofouling, and Quorum Sensing
	Antibiotic Resistance, Evolution, and Selfish Gene
	Viruses
5	Biofuels
	Course Review
	Presentation
	Final exam week (no class)

EMERGENCIES AND PREPAREDNESS

"In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. You can get in touch with the instructor or TA for more information in such an event. Purdue University is a very safe campus and there is a low probability that a serious incident will occur here at Purdue. However, just as we receive a "safety briefing" each time we get on an aircraft, we want to emphasize our emergency procedures for evacuation and shelter in place incidents. Our preparedness will be critical if an unexpected event occurs. Emergency preparedness is your personal responsibility. Purdue University is continuously preparing for natural disasters or human-caused incidents with the ultimate goal of maintaining a safe and secure campus. Some of the emergency procedures include:

- To report an emergency, call 911.
- To obtain updates regarding an ongoing emergency, and to sign up for Purdue Alert text messages, view www.purdue.edu/ea
- There are nearly 300 Emergency Telephones outdoors across campus and in parking garages that connect directly to the Purdue Police Department. If you feel threatened or need help, push the button and you will be connected immediately.
- If we hear a **fire alarm**, we will immediately suspend class, **evacuate the building**, and proceed outdoors, and away from the building. **Do not use the elevator.**
- If we are notified of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter in the lowest level of this building away from windows and doors.
- If we are notified of a Shelter in Place requirement for a hazardous materials release, or a civil disturbance, including a shooting or other use of weapons, we will suspend class and shelter in our classroom, shutting any open doors or windows, locking or securing the door, and turning off the lights.
- Please review the Emergency Preparedness website for additional information: http://www.purdue.edu/ehps/emergency_preparedness/index.html" (source: Office of the Provost at Purdue University)