PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING
ABET COURSE SYLLABI

ICH3384 ENVIRONMENTAL BIOTECHNOLOGY

Credits and contact hours: 10 UC credits/ 10 hours (4,5 h. Lectures and 5,5 h. Independent learning experiences)

Instructor's name: Gonzalo Pizarro

Course coordinator's name Gonzalo Pizarro

Textbook: Rittmann, B. & McCarty, P. Environmental Biotechnology: principles and applications. McGraw Hill, 2002

Course Catalog Description: Microorganisms catalyze chemical reactions that occur very slowly under abiotic conditions in nature. With an engineering perspective, we can use these metabolic capabilities to our advantage in the design and operation of biotechnological treatment systems. This course aims to familiarize students with the application of modern biological processes for the protection and restoration of environmental quality. Through a combination of lectures, talks by experts, applied projects and laboratory experiments, students review key aspects of environmental microbiology used for the design of biological treatment systems using mathematical modeling and experimental evidence from laboratory.

Prerequisite Courses: ICH 2314 Water Quality or ICH 3314 Water Quality

Co-requisite Courses: None

Status in the Curriculum: Required Crr 2009

Course Learning Outcomes:

- Apply basic concepts of environmental microbiology, including: taxonomy, phylogeny, metabolic diversity, aerobic metabolism, metabolism anoxic, anaerobic and photosynthetic metabolism and microbial ecology in environmental engineering problems. Emplear expresiones de cinética microbiana en distintos contextos de análisis y diseño.
- Develop and implement stoichiometric equations to represent microbiological processes, mathematical models of microbial growth, substrate utilization and mass balance applicable to aquatic systems.
- Integrate fundamental concepts of microbial kinetics and energy, mass balance, and reactor theory for dimensioning biological wastewater treatment units.
- Design and analyse biofilm treatment systems.
- Understanding the impacts and potential use of environmental

biotechnology to public health and the environment.

- Use basic and advanced analytical techniques for analysis and design of biological wastewater treatment processes.

Relation of Course to ABET Criteria:

c. Design a system, component, or process
e. Identify, formulate, and solve engineering problems
j. Knowledge of contemporary issues
k. Techniques, skills, and modern tools for engineering practice.

Topics covered:

The course content is divided into three sections: (1) Fundamental concepts of biological treatment, (2) biological treatment technologies, and (3) Systems and biological treatment plants.

1. Basic aspects of microbiology.
3. Microbial kinetics.
4. Activated Sludge.
5. Biofilms.
6. Nitrification-denitrification.
7. Anaerobic digestion.
8. Aerobic digestion.
9. Biosolids treatment.