

SYLLABUS

ENE 804: BIOLOGICAL PROCESSES IN ENVIRONMENTAL ENGINEERING

Fall Semester 2019

Time: Tuesday, Thursday: 1:00 PM to 2:20 PM

Location: 2320 Engineering Building

	TOPIC	READINGS	DATE
1	Energetics and Stoichiometry of Biological Reactions Oxidation State and Half Reactions Energetics and Stoichiometry of Growth and Maintenance	Chapter 2, Handout	8/29, 9/3, 5
2	Wastewater Characteristics Chemical and Microbial Quality, Oxygen Demand	Handout	9/10
3	Kinetics of Suspended-Growth Biological Processes Rates Kinetic Coefficients System Control Parameters Reactors without Recycle Reactors with Recycle	Chapters 3 & 5	9/ 12, 17, 19, 24
Examination I: Sections 1 to 3			9/26
Note: 9/23 - End of tuition refund period for Fall semester courses - no refund after this date.			
4	Activated Sludge Process Stoichiometry and Kinetics Process Configurations Loading Criteria Clarifier Design Sludge Bulking	Chapter 6	10/1, 3, 8
5	Nitrification and Denitrification Stoichiometry Kinetics and processes	Chapters 9 & 10	10/10, 15, 17
6	Biological Phosphorus Removal Kinetics and processes	Handout	10/22, 24
Examination II: Sections 4 to 6			10/29
Note: 10/16 - 5			

7	Anaerobic Processes (Methanogenesis) Anaerobic Process Ecology Kinetics and Stoichiometry pH Control Toxicity and Inhibition Solids Processing	Chapter 13 Handout	10/31, 11/5, 7, 12
8	Attached-Growth Biological Processes Immobilized/Attached-Growth/Fixed-Film Reactors Basic Kinetic Relationships Steady-State Biofilm Model Biofilm Detachment, Simplified Design Method Non-steady State Biofilms Trickling Filters, Rotating Biological Contactors, Activated Biofilter Membrane Bioreactors Aerated Fixed and Fluidized Beds	Chapters 4 & 8	11/14, 19, 21, 26, 12/3
Note: 11/28, 11/29: Holiday - University Closed			
9	Bioremediation, Resource Recovery & Sustainability Key concepts and issues Contaminants, Cometabolism Biostimulation and Bioaugmentation	Handout, Chapters 14 & 15	12/5, 10

Final Exam – Comprehensive Take-home: 12:45 PM to 2:45 PM **12/12**

TEXTBOOKS

1. **Bruce E. Rittmann and Perry L. McCarty, Environmental Biotechnology: Principles and Applications, 2001**

Other books that may be helpful as a reference for selected topics (available in the Library):

1. Wastewater Treatment and Reuse: Theory and Design Examples: (Two-Volume Set) 1st Edition. CRC Press - by Syed R. Qasim and Guang Zhu
2. Metcalf & Eddy, Inc. Wastewater Engineering, Treatment and Reuse. Fourth Edition, McGraw Hill Book Co., New York, 2003 (For wastewater characteristics and treatment plant design concepts)
3. Anaerobic Biotechnology, by Richard E. Speece, Archaea Press (for Anaerobic Microbiology)

INSTRUCTOR

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GRADING POLICY

Grades will be based upon the total points accumulated for examinations and homework assignments. The weighting scale is:

Exam I	25%
Exam II	25%
Final Exam	25%
Homework	25%
Total	100%

EXAM POLICY

- Exams I and II are of closed book, closed notes type on the units mentioned above. Final Exam will be a take home exam and comprehensive.
- For Exam I, a **one-page** (8.5"x11") sheet is allowed for writing formulas and notes etc. on both sides.
- For Exam II, **one additional page** is allowed (so two pages total). You could bring the page that you prepared during Exam I or prepare two fresh pages.
- During the exams, a student may not use anything belonging to another student and may not give, solicit, or accept any assistance.

HOMEWORK POLICY

- Homework assignments individually completed by each student are due at class time on the announced due date. A total of 5 homework assignments are planned, due generally a week from the date they are assigned with some flexibility.
- Please do not submit homework that is a copy of another person's homework even if you did it together. Both will be graded as zero.