

# **Introduction to Biochemical Engineering**

155:411

Fall semester, 2017

Mon/Wed 12pm-1:20 pm

Instructor: Haoran Zhang      email: haoran.zhang@rutgers.edu

**Office hours:** Fri 11 am-12 pm    Engineering building C106

**Textbook:** Bioprocessing Engineering: Basic concepts (2<sup>nd</sup> Edition) M.L. shuler/F. Kargi

## **Course Description:**

Introduction of the basics biochemistry, biology and microbiology with applications in biochemical engineering. Explanation of how biochemical engineering is used for the analysis, control, and development of biological, biochemical, and industrial processes. Quantitative, problem-solving methods emphasized.

## **Course Objectives:**

In this course, students learn the basics of biochemical engineering, and apply the knowledge to answer the following questions.

- What are the major components of cells?
- How do cells grow?
- How do metabolic pathways decide the formation of different compounds?
- How can cells be engineered genetically and metabolically?
- How can bioprocesses be established and scaled up?

## **Grading**

Total 100%: Homework (30%); Exam 1 (20%); Exam 2 (20%); Final (30%)

Homework should be submitted at the beginning of the class on the designated date. There is a 30% penalty for late submission. Homework submitted one week after the due day will NOT be graded.

Projected Schedule (subject to change)

lecture	Dates	Topic	Textbook chapter(s)	HW assign	HW due
1	9/6/2017	Introduction	1,2		
2	9/11/2017	Overview of Biology	2		
3	9/13/2017	Enzyme	3		
4	9/18/2017	Cell metabolic pathways and cell growth 1	5,6		
5	9/20/2017	Cell growth 2	6	Hw 1	
6	9/25/2017	Cell growth 3	6		
7	9/27/2017	Stoichiometry of Growth	7		Hw 1
8	10/2/2017	Cell growth regulation	4		
9	10/4/2017	Genetic alteration 1	8	Hw 2	
	10/9/2017	Exam 1			
10	10/11/2017	Exam 1 review & Genetic alteration 2	8		Hw 2
11	10/16/2017	Bioreactors 1	9		
12	10/18/2017	Bioreactors 2	9		
13	10/23/2017	Scale up	10		
14	10/25/2017	Sterilization	10.4	Hw 3	
	10/30/2017	Special topic (subject to change)			
15	11/1/2017	Enzyme immobilization	3.4		Hw 3
16	11/6/2017	Bioseparations 1	11		
17	11/8/2017	Bioseparations 2	11	Hw 4	
18	11/13/2017	Bioseparations 3	11		
	11/15/2017	Exam 2			Hw 4
19	11/20/2017	Exam 2 review			
	11/22/2017	<i>No class: Wednesday=Friday. Happy Thanksgiving!</i>			
20	11/27/2017	Using genetically engineered microbes 1	14		
21	11/29/2017	Using genetically engineered microbes 2	14		
22	12/4/2017	Metabolic engineering	14.8		
23	12/6/2017	Mixed culture	16	Hw 5	
24	12/11/2017	Animal cell engineering	12		
25	12/13/2017	Q&A			Hw 5
	TBD	Final exam			