

ABE /CHEE 481a / 581a Bioprocess Engineering Fall 20xx
Days / Time / Location TBD
Dr Ogden
WEB SITE for Class <http://d2l>

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Office Hours: TBD, email if need to meet another time

Course Description

To learn to apply to the design of biological systems principles of engineering, science and mathematics, including, but not limited to statistics, kinetics, sensors and bioreactor design and scale up. To explore and be familiar with the principal areas of biological engineering such as food process engineering, tissue engineering, and other large-scale fermentation processes.

Course Objectives

1. To explore and become familiar with enzyme kinetics, cell growth, and bioreactor design as applied toward industrial processes.
2. To apply engineering and biological fundamentals to the design of systems for industrial production of desired materials with an emphasis on biofuel and pharmaceutical products.

<u>Grading Criteria</u>	<u>481a</u>	<u>581a</u>	<u>Grading Scale</u>	
Exams (2 total, 25% each) 9/16 & 10/26	50%	40%	90.0 – 100.0	A
Homework/Participation	25%	20%	80.0 – 89.9	B
Final Exam Friday 12/9 10:30 -12:30	25%	20%	70.0 – 79.9	C
Paper and Presentation		20%	60.0 – 69.9	D
Total	100%	100%	< 60.0	E

The exams for the undergraduate and graduate students will be the same. The graduate students will also have a paper.

Depending on interest, we will have some guest lecturer and tours.

Class Policies

1. Each assignment that is submitted late will be penalized by reducing its score by 10% for each day that it is late. Also 5% for late the day it was due.
2. We will do many in class activities that will be a substantial part of your homework grade. Students will read material in advance and we will have discussions and work problems in class after a quick review of the material.
3. You will need access to D2L during class for discussion/participation.
4. We will have one laboratory which will be scheduled during class time.

5. Adherence to official university rules and regulations pertaining to the classroom is mandatory.
6. HW is to be turned in individually, except where explicitly noted.

Text

Bioprocess Engineering, 2nd Ed. Shuler and Kargi; Various handouts/papers

Paper Requirements for Graduate Students/Honors

Each student is required to write a term paper that is relevant to topics covered within the class. The term paper is a critical review of one area of the current literature in biotechnology and bioengineering.

The paper must have the following parts:

- a) Introduction to the subject including any relevant background material which is required for the reader to understand the area.
- b) Description of the most important topics of investigation (what is not known about this field, but should be?).
- c) Relevant experimental work in the area (a typical apparatus may be included as a figure). Compare and contrast the experiments from multiple publications. Point out flaws or aspects that are missing in the experiments, like controls.
- d) Relevant theoretical work in the area, showing the types of models used. Compare the number of adjustable parameters with accuracy. Comment on the assumptions made.
- e) Describe what topics should be the focus of future investigation. What experiments should be performed? Do not use the first person in your writing.
- f) Conclusions and summary.

The paper must be based upon critical analysis of 5 to 10 original works (one review article may be helpful), with at least two published since 2014. These papers need to be from peer reviewed journals or web sites. Web journals that are clearly peer-reviewed are fine. Topics should be related to bioprocess engineering.

The paper should be around 10 typed, double spaced pages.

Paper Grading Sheet

Abstract	_____ / 5
Introduction	_____ / 10
Discussion and Examples	_____ / 20
Critical Review of Examples	_____ / 25
Conclusions	_____ / 10
Future Work	_____ / 10
References	_____ / 10
Organization/Style/Grammar/Spelling	_____ / 10
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TOTAL	_____ / 100

Time line

Paper topic in drop box on D2L	Day Date
References (just the list) in drop box	Day Date
Draft of the paper (optional, can receive un-graded feedback)	Day Date
Final paper due (you can submit early) to drop box	(Day) last day of class (Date)

Reference format should be as follows:

Journal Article:

Roos, J. W. and Hjortso, M. A. (1989), "Control of mixed cultures via specific cell adhesion," *Biotech. Bioeng.* **33**: 638-649.

Article or Chapter of a Book:

Asenjo, J. A. and Maugeri, F. (1992), "An expert system for selection and synthesis of protein purification processes." In *Frontiers in Bioprocessing II*. Todd, P., Sikdar, S. K., and Bier, M. Eds. American Chemical Society: Washington D. C. pp. 358-379.

Book:

Freed, K. F. (1987), *Renormalization Group Theory of Macromolecules*, John Wiley and Sons: New York, NY pp 1-36.

Where to start - Take a look at some of these journals in biological engineering. The UA has online subscriptions to each of these. If you access from a UA ip address, you should be able to receive pdf files of most articles.

Biotechnology and Bioengineering

<http://www3.interscience.wiley.com/cgi-bin/jhome/71002188>

Biotechnology Progress

<http://pubs.acs.org/journals/bipret/>

Metabolic Engineering

http://www.elsevier.com/wps/find/journaldescription.cws_home/622913/description#description

Applied and Environmental Microbiology

<http://aem.asm.org/>

Biophysical Journal

<http://www.biophysj.org/>

Annals of Biomedical Engineering

<http://www.ruf.rice.edu/~abme/annals.html>

Biosensors and Bioelectronics

<http://www.sciencedirect.com/science/journal/09565663>