

BE 3340: Process Design in Biological Engineering
Spring 2017 Syllabus

Meeting Schedule: Lecture 8:00-8:50 am Tuesday/Thursday 228 Tureaud
Lab 1:30-4:20 Tuesday 228 Tureaud Hall

Text Books: none required

References: Seider, W. D., Deader, J. D., and D. R. Lewis. Product and process design principle. John Wiley and Sons, Inc., New York, NY.

Belter, P.A., E.L. Cussler, and W.S. Hu. 1988. Bioseparations. Downstream processing for biotechnology. John Wiley & Sons. New York, NY.

Harrison, R.G., Todd P.W., Petrides, D.P. Bioseparations Science and Engineering, Oxford University Press, New York, NY

Instructors: Cristina M. Sabliov, E-mail: csabliov@lsu.edu, Office Hours: T 9:00-10:00 am
Carlos E. Astete, E-mail: castete@agcenter.lsu.edu

Teaching Assistant: Sumit Libi, E-mail: slibi2@lsu.edu, Office Hours: W 9:00-10:00 am

Course Objectives:

After completing this course, you should be able to:

1. Define process design and its role in Biological Engineering
2. Determine the impact of various factors on specific unit operations
3. Use available models to analyze and design partial or full bioprocesses
4. Evaluate potential process designs and select specific designs for a given situation

ABET A-k outcomes addressed by the course:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

This is a certified Communication-Intensive (C-I) course which meets all of the requirements set forth by LSU's Communication across the Curriculum program, including:

1. Instruction and assignments emphasizing informal and formal writing and speaking
2. Teaching of discipline-specific communication techniques;
3. Use of draft-feedback-revision process for learning;
4. Practice of ethical and professional work standards;
5. 40% of the course grade rooted in communication-based work; and
6. A student/faculty ratio no greater than 35:1.

Students interested in pursuing the LSU Distinguished Communicators certification may use this C-I course for credit. For more information about this student recognition program, visit www.cxc.lsu.edu.

Course Policies

- You will work on the **project** in groups assigned during the first week of classes. Each group will have the opportunity to present their work in front of the class. A peer-review panel will be conducted for the midterm and final project report.
- **Examinations** and **labs** missed due to an unexcused absence cannot be made up and a grade zero will be given for each one missed.
- Any student requiring **special arrangements** for taking exams, taking-notes and other special arrangements please see or contact the instructor within the first two weeks of class.

Course time involvement

This is a 3-credit hour course. According to current federal regulations, for each credit hour earned, the students are expected to spend at least 2 hours outside the formal class meetings, performing academic work related to the course content. This work can include, but is not limited to, homework assignments, reading and writing assignments, project-related work, laboratory reporting and writing assignments, and other necessary work required to accomplish the course's learning objectives.

Academic Integrity

Students are expected to comply with the Code of Student Conduct throughout this course. For your information, the Code of Student Conduct can be found at

<http://students.lsu.edu/saa/students/code?destination=node/1188>

Grading policy:

All homework assignments will be turned in electronically via Moodle in PDF Document format. Handwritten assignments can be scanned as high-resolution images and imported as PDF. Homework is due at the beginning of class on the due date. Homework assignments turned in late will not be accepted and will be assigned a grade of zero. Grades will be determined based on the following break down:

Midterm exam 20%, Final exam 20%, Quizzes 10%, Lab reports 10%, Homework 10%, Design Project 30%.

Grade Assignments:

| | | |
|-----------------|---------------|----------------|
| 97% ≤ A+ ≤ 100% | 93% ≤ A < 97% | 90% ≤ A- < 93% |
| 87% ≤ B+ < 90% | 83% ≤ B < 87% | 80% ≤ B- < 83% |
| 77% ≤ C+ < 80% | 73% ≤ C < 77% | 70% ≤ C- < 73% |
| 67% ≤ D+ < 70% | 63% ≤ D < 67% | 60% ≤ D- < 63% |
| F: < 60% | | |

TENTATIVE LECTURE SCHEDULE

| Date | Topic |
|----------|---|
| January | 12 Introduction to the course |
| | 17 Lab 1. Laboratory safety and tour of the labs Overview of bioprocess engineering <i>Task: choose your team and your product</i> |
| | 19 Integration of processing steps |
| | 24 Lab 2. Yogurt Production |
| | 24 The design process and lecture dedicated to project |
| | 26 Super Pro Designer introduction |
| | 31 Lab 3. Super Pro Designer hands-on session |
| | 31 Filtration |
| February | 2 Filtration <i>Task: Homework filtration assigned (due on February 9th at 8:00 am)</i> |
| | 7 Lab 4. Super Pro Designer hands-on session |
| | 7 Problems- filtration |
| | 9 Centrifugation |
| | 14 Lab 5. Super Pro Designer hands-on session (own project) |
| | 14 Centrifugation <i>Task: Homework centrifugation assigned (due on February 21st at 8:00 am)</i> |
| | 16 Problems – centrifugation |
| | 21 Lab 5. Super Pro Designer presentations <i>Task: Midterm paper and presentations due at 1:30 pm</i> |
| | 21 Presentations discussion |
| | 23 Panel review-mock <i>Task: Reports assigned for review (due on March 7th at 8:00 am)</i> |
| | 27 Mardi Gras |
| | 28 Mardi Gras |
| March | 2 Exam review |
| | 7 EXAM 1 |
| | 7 Midterm panel session I |
| | 9 Midterm panel session II |
| | 14 Lab 6. Midterm panel session III |
| | 14 Economic analysis |
| | 16 Cell disruption |
| | 21 Lab 7. Extraction lab |
| | 21 Extraction |
| | 23 Extraction |

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| March | 28 | Lab 8. Sugar Institute field trip |
| | 28 | Problems- extraction |
| | 30 | Problems- extraction <i>Task: Homework extraction assigned (due on April 6th at 8:00 am)</i> |
| April | 4 | Lab 9. Adsorption lab |
| | 4 | Adsorption |
| | 6 | Adsorption |
| | 9-16 | Spring Break |
| | 18 | Lab 10. Lab dedicated to project (Final paper due at 5:30 pm) |
| | 18 | Problems- adsorption <i>Task: Homework adsorption assigned (due on April 25th at 8:00 am)</i> |
| | 20 | Chromatography <i>Task: Reports assigned for review (due on April 24th at 8:00 am)</i> |
| | 25 | Lab 10. Final panel I |
| | 25 | Final panel II |
| | 27 | Review for final exam* |

*Final Exam scheduled on May 4th, 7:30-9:30 am.