

MICR/CFS 454/654 Bioprocessing

Course description

The use of microorganisms and enzymes for processing agricultural materials into industrial products, including foods, biofuels and antimicrobials.

Learning objectives

- To gain an appreciation for the historical development, current importance and potential future impacts of bioprocessing
- To gain knowledge of fundamental topics and scientific principles and methods related to bioprocessing
- To gain an understanding of commercially important bioprocessing operations used to produce a wide variety of products
- To gain hands-on practical experiences with a diverse range of bioprocessing applications under real-world conditions
- To gain exposure to career opportunities in bioprocessing
- To gain and develop success skills in communication, critical thinking, interaction, information acquisition, organization, professionalism, auto-didactics and lifelong learning

Methods

1. Two one-hour lectures per week
 - a. About 30 class periods total
 - b. Guest speakers will be incorporated as appropriate
2. One three-hour laboratory per week
 - a. About 12 class periods total
 - b. Will include relevant field trips to sites such as local processing facilities, dairy plants, micro-breweries, wineries

Disabilities

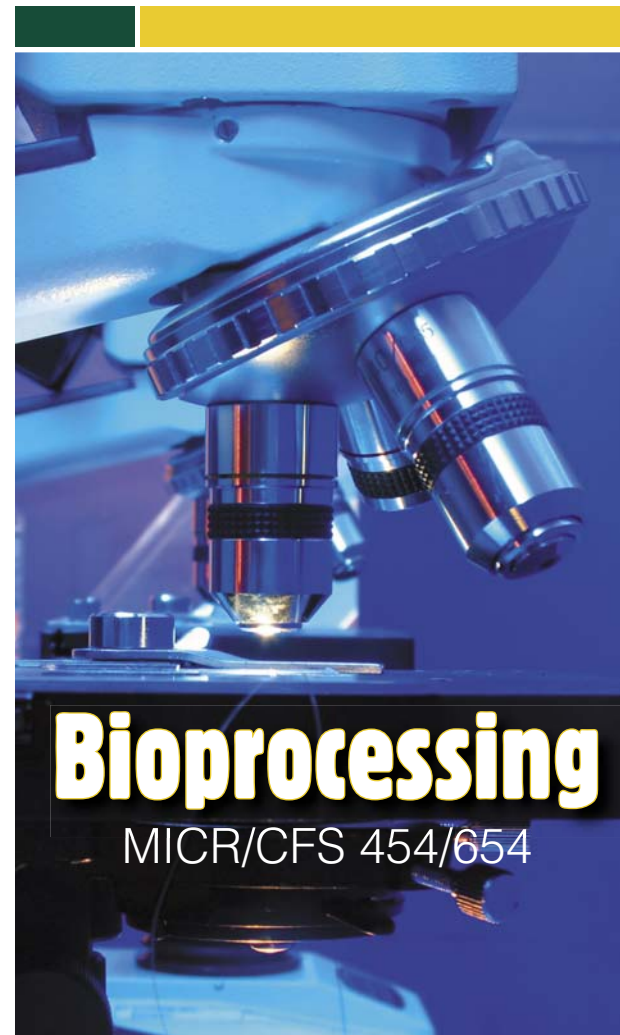
Any students with disabilities or who need special accommodations in this class are invited to share their concerns or requests with the instructor as soon as possible. See the Counseling and Disability Services Web site at www.ndsu.nodak.edu/counseling/disability.shtml.

Academic dishonesty/plagiarism

All work in this course must be completed in a manner consistent with NDSU University Senate Policy, section 335: Code of Academic Responsibility and Conduct (www.ndsu.nodak.edu/policy/335.htm), and with the College of Agriculture, Food Systems, and Natural Resources Honor System (www.ag.ndsu.nodak.edu/colag/honor.htm). The Honor System operates to prevent and stop cheating, as well as penalizing those who cheat. Cases can be reported to any Honor Commission member, your instructors or the dean of agriculture.

University closures: Check Blackboard and/or your e-mail for updates. If these are unavailable, assume assignments still are due by the original time.

NDSU is an equal opportunity institution.
This publication will be made available in alternative formats for people with disabilities upon request, (701) 231-7881.



Bioprocessing

MICR/CFS 454/654

Department of Veterinary and
Microbiological Sciences

Department of
Cereal and Food Sciences

NDSU

North Dakota State University



MICR/CFS 454/654 Bioprocessing

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3 credits

Taught spring semesters of odd-numbered years

Prerequisites

MICR 202L and CHEM 260, equivalent or graduate standing

Lab fee: \$35

Grading

Assignments	Points	% Final Grade
Quizzes (6, 25 points each)	150	30
Lab reports	150	30
Project paper	70	14
Team presentation	30	6
Final exam	100	20
Total Points	500*	100*

Detailed instructions for these assignments will be provided separately.

**Those registered in MICR/CFS 654 will have an additional 55 points (adjust percentages accordingly) for a project proposal.*

Grading scale

- 89.5 to 100% = A
- 79.5 to 89.4% = B
- 69.5 to 79.4% = C
- 59.5 to 69.4% = D
- below 59.5% = F

Instructors

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Office hours

By appointment is best, but stop by to see if either of us is in. We also respond promptly to e-mail and voice mail. Resources will be available through Blackboard to facilitate communication, as well.

Suggested student resource

Waites, J.M. 2001. Industrial Microbiology: An Introduction. Blackwell Science Ltd., Malden, Mass. List price for paperback about \$70. A copy is on reserve in the library for two-hour checkout.

Online access

Portions of the course material, including all supplemental reading materials, will be available online through Blackboard at <http://its.ndsu.nodak.edu/blackboard/gateway.html>.

Course outline

Quizzes will be given on Blackboard after each major lecture section is completed. A separate schedule will be provided for the lab meetings, along with activity instructions. A lab report will be required for each lab exercise completed; instructions for these will be discussed and provided on Blackboard. Project papers and team presentations will be due during the lab period of the last week of classes; instructions for these will be discussed and provided on Blackboard. Graduate student proposals will be due at midterm; instructions for these will be discussed and provided on Blackboard.

Lectures 1-5

1. Introduction to bioprocessing
2. Review
 - a. Enzymology
 - b. Microbial physiology and effects of intrinsic and extrinsic factors

Lectures 6-10

3. Traditional and modern food and beverage bioprocessing
 - a. Dairy fermentations
 - b. Meat fermentations
 - c. Grain fermentations
 - d. Fruit and vegetable fermentations
 - e. Indigenous and miscellaneous food and beverage fermentations
 - f. Food additive production
 - i. High fructose corn syrup production
 - ii. Etc.

Lectures 11-15

4. Other types of industrial bioprocessing
 - a. Bioreactors
 - i. Design, instrumentation and sterilization
 - ii. Downstream processing and product recovery
 - iii. Microbial screening and selection
 - iv. Etc.

Lectures 16-20

- b. Practical applications
 - i. Fuel ethanol production
 - ii. Antimicrobials
 - iii. Etc.

Lectures 21-25

5. Innovations in biotechnology
 - a. Genetic manipulations
 - i. Food-grade applications and limitations
 - ii. Industrial applications and limitations
 - b. Other current topics

Lectures 25-30

6. Regulation and other current topics