

Agricultural and Biological Engineering 488 (ABE488) Bioprocessing Biomass for Fuel Course Syllabus

Instructor:	Vijay Singh, Office: 360G AESB; Phone: 333-9510; Email: vsingh@illinois.edu
TAs	Shuchi Singh, Email: shuchis@illinois.edu Shraddha Maitra, Email: smaitra@illinois.edu Somesh Mishra, Email: someshm@illinois.edu
Prerequisite:	Junior or Senior standing or consent of instructor.
Text:	The Alcohol Textbook Edited by G.M. Walker, C. Abbas, W.M. Ingledew, C. Pilgrim. Published by Lallemand Biofuels & Distilled Spirits in 2017 6 th Edition. Text can be ordered at this website: https://www.lbds.com/en/north-america/ethanol-technology-institute/the-alcohol-textbook/
Lecture:	Tuesdays and Thursdays 12:30 - 1:50 pm, room 248 AESB or room 220 AESB. In addition to in-class lectures, there will be approximately 1 hour or more of required video lectures each week.
Credit:	4 Hours

Course Description: Study of engineering and scientific principles involved in industrial bioprocessing of cereal grains/starch/sugars/ biomass for the production of ethanol and other fermentation products. Production of ethanol, cellulosic ethanol, and other fermentation products will be covered. Process unit operations, conventional and alternative feedstock materials, recovery of valued-added coproducts, and other variables involved in producing fuel ethanol will be discussed. Process simulation and economic analysis will also be covered.

Course Objectives:

1. Understand step-by-step descriptions of the basic ethanol, cellulosic ethanol, and other fermentation bioproducts production processes
2. Learn cereal grain/biomass fractionation techniques to recover carbohydrates and other coproducts
3. Learn process simulation and economic modeling

Other References:

Wyman, C.E. 1996. *Handbook on Bioethanol: Production and Utilization*. Talyor & Francis Publishing Office, Washington, DC.

Vertes, A.A., Qureshi, N., Blaschek, H.P., and Yukawa, H. 2010. *Biomass to Biofuels*. Wiley & Sons, West Sussex, UK

Brown, R.C. 2003. *Renewable Resources*. Blackwell Publishing, Ames, IA.

White, P.J., Johnson, L. A., and May, J. B. 2004. *Corn: Chemistry and Technology 2nd Edition*. American Association of Cereal Chemists, St. Paul, MN.

Peters, M.S. and Timmerhaus, K.D. 2003. *Plant Design and Economics for Chemical Engineers*. 5th Edition McGraw-Hill Publishers, Singapore.

Relevant Journals:

Biomass & Bioenergy, Applied Biochemistry & Biotechnology, Bioresource Technology, Cereal Chemistry, Ethanol Producer Magazine, and Transactions of ASABE.

Course Delivery

The entire course will be delivered in person. All the lecture notes, videos, and assignments will be through Canvas. Some lectures and office hours might be through Zoom. It is your responsibility to attend all lectures, watch all the video lecture content, review lecture notes, and follow the schedule and deadlines for assignments and the semester design project.

Weekly Canvas Quiz:

Almost every week, there will be a quiz on Canvas. Be very careful when you take the weekly quiz; only two attempts will be allowed. No additional attempts will be allowed under any circumstances. Two attempts at weekly quizzes are not to improve your grade but to account for any IT, internet, or other issues that are beyond your control. The highest-graded attempt will be used to calculate the quiz grade. During final grade calculation, we will drop one of your lowest-graded weekly quizzes.

Exams:

There will be three one-hour exams during the semester (see schedule). All exams will be in person, closed-book, and closed-notes. **Exams will not be rescheduled under any circumstances.**

There is no final exam.

Assignments/Projects:

Assignments and projects are critical components in learning course concepts. There will be several assignments/project reports given during the semester. Check the due date schedule and submit everything electronically on Canvas. It is your responsibility to check that the assignment gets uploaded correctly and by the due date. Incorrect or late-submitted assignments will not be graded. It is also your responsibility to check your grades and any feedback on each assignment/project report. Any help with assignments/project reports/SDP will be provided during office hours, not via email.

Semester Design Project:

A semester design project (SDP) using SuperPro Designer will be assigned early in the semester

and will be due prior to finals exam week in December (see schedule). SDP will be a team project focused on process design simulation and economic analysis of a conventional dry grind. Towards the end of the semester, students will submit a comprehensive design report that includes scale-up, alternative process design, and economic evaluation scenarios. All students will present their final design report to the class. If you want to see your graded SDP final report, you must contact the instructor/TA by December 26. After that time, everyone's SDP report will be shredded.

Class Participation:

Class participation will be assessed based on attendance at lectures, completion of Canvas quizzes, participation in group discussions, or use of iClickers.

Computer Crash Policy:

All computers eventually crash and/or get viruses. It is your responsibility to back up your assignments. Computer problems, viruses, or other IT issues are not acceptable excuses for late work, unsubmitted assignments, or projects or quizzes.

Academic Integrity: Academic Integrity:

Academic misconduct (plagiarism, cheating, or other forms of misconduct as defined by the university) will not be tolerated in this course. Academic Misconduct is defined as any activity which tends to compromise the academic integrity of the institution or subvert the educational process. According to Article 1 of the Student Rights and Responsibilities - Part 4 (Academic Integrity and Procedure): No student shall use or attempt to use any academic exercise materials, information, study aids, or electronic data that the student knows or should know is unauthorized. This includes copying, direct quotation without citation, paraphrasing without citation, or providing false or misleading information for the purpose of gaining an academic advantage. Please see Academic Integrity Infractions at: http://studentcode.illinois.edu/article1_part4_1-402.html for a complete outline.

Students with Disabilities:

Students with disabilities who have not registered for services with the Division of Rehabilitation Education Services and who wish to request accommodations should contact the coordinator for Student Services with the Division at 333-4603 (voice or TTY). Reasonable efforts will be made to accommodate students with disabilities in this course. Supplementary videos for lectures and slides/notes are available on Canvas as accommodations. Canvas quizzes are designed to give students requiring accommodation more than enough time to complete them. Inform me and provide me with your DRS letter as soon as possible (first week of the course) if you require accommodations.

Emergency Response Recommendations

Emergency response recommendations can be found at the following website:

<http://police.illinois.edu/emergency-preparedness/>. I encourage you to review this website and the campus building floor plans website within the first 10 days of class.
<http://police.illinois.edu/emergency-preparedness/building-emergency-action-plans/>.

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See <https://registrar.illinois.edu/academic-records/ferpa/> for more information on FERPA.

Sexual Misconduct Policy and Reporting

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options. A list of the designated University

employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential. Other information about resources and reporting is available here: wecare.illinois.edu.

SuperPro Designer Software:

We will use SuperPro Designer Software for the semester design course. This software is available in the computer lab (ACF, ACES Library). You will be provided access to this software in the computer lab. It is your responsibility to complete all the SDP and other assignments during computer lab hours. Remote login to the computer lab is available 24/7 from this page:

<https://secure.aces.illinois.edu/acf/campus/remote/index.html>

I-Clickers:

We will use iClicker during lectures throughout the semester. Each student is expected to have either an individual iClicker device or an active online iClicker subscription and to bring it to every class. It is your responsibility to ensure that your iClicker is registered on Canvas and functioning properly before each lecture. Most lectures will include graded iClicker quizzes, although paper quizzes may occasionally be used instead. No partial credit will be awarded if you do not have your iClicker, your iClicker is not working properly, or you are otherwise unable to participate in the quiz. iClickers can be purchased from the Illini Union Bookstore. Or you can get an online iClicker subscription. Missed iClicker or paper quizzes cannot be made up, even in the case of an excused absence. To accommodate unavoidable circumstances, the two lowest iClicker/paper quiz scores will be dropped when calculating your final course grade.

<https://answers.uillinois.edu/120820> (iClicker Instructions for Students - Knowledgebase)

Office hours

We will have office hours every Wednesday from 4.00 to 5.00 pm in AESB 137. We will discuss any questions or doubts about the class lecture and assignments.

Grading:	<u>Points</u>	<u>%</u>
<i>Hour Exams (3 exams @ 75 points/each)</i>	225	45%
<i>Canvass Quizzes or I-clicker Quizzes</i>	100	20%
<i>SuperPro or Other Assignments</i>	50	10%
<i>Final Project</i>	<u>125</u>	<u>25%</u>
Total	500	100%

Approximate Grading Scale (%): 98.00-100 = A+; 93.00-97.99% = A; 90.00-92.99 = A-; 87.00-89.99 = B+; 83.00-86.99 = B; 80.00-82.99 = B-; 77.00-79.99 = C+; 73.00-76.99 = C; 70.00-72.99 = C-