Advanced Biofuel Production from Renewable Resources
Fall 2013 Syllabus, Louisiana State University

Meeting Schedule: Lecture: 4:30-7:20 pm M, location 115 EB Doran

Textbook: Robert C. Brown, Biorenewable Resources. Blackwell Publishing, Iowa State Press, 2003.
Pre-requisite: Transport Phenomena, Thermodynamics, or consent of Instructor
Instructor: Dorin Boldor, PhD E-mail: dboldor@agcenter.lsu.edu Phone: 225 578 7762
175 EB Doran Bldg. Office Hours: T: 10:30 – 11:30 am (or by appointment)

Teaching Assistants: TBA

THIS COURSE INCLUDES A SERVICE-LEARNING COMPONENT (see Service-Learning Design Project Activities)

Course Objectives:
The course covers the principles of biofuel production using different technologies. Fundamental concepts are used to design different engineering processes required for production of bioethanol, biodiesel, bio-oil, and other biobased products. The specific objectives of the course are to:

1. Identify, define, and explain the different products that can be obtained from renewable resources, as well as how they are obtained.
2. Apply knowledge of mathematics, science, and engineering to create biofuels and other products from renewable resources (ABET Objective a.)
3. Learn to design and conduct experiments for production of biofuels and other products from renewable resources, as well as to analyze and interpret data (ABET Objective b.)
4. Identify the relevant operating parameters and use them to design a system, component, or engineering process to meet desired needs (ABET Objective c.)
5. Identify, formulate and solve biological engineering problems based on the physical and engineering properties of the renewable feedstock source (ABET Objective e.)
6. Learn techniques, skill, and modern engineering tools necessary for the engineering practice (ABET Objective k.)
7. Learn to function in multidisciplinary teams addressing contemporary issues in engineering-related properties of biological materials, with an understanding of the professional and ethical responsibility when communicating and collaborating with outside community partners (ABET Objectives d., f., g., j.)
8. Reflect on the learning experience provided in the service-learning component of the course, and understand the need for life-long learning and the impact engineering practice and solutions have on the society (ABET Objectives h., i.)

Web Page
A course web page will be made available through LSU's Moodle to enhance the course contents. Students are requested to visit this web site on a regular basis. The course web site contains the course syllabus, additional lecture notes and materials, and review materials. Class notes will be posted on-line before each lecture.

Service-Learning Design Project Activities, Expectations, Policies, and Evaluation
THIS COURSE INCLUDES A SERVICE-LEARNING COMPONENT: Service-Learning is an experience in which students participate in a service activity that meets community needs and reflect on the service activity to gain further understanding of course content, a broader appreciation of the discipline, and an

enhanced sense of civic responsibility. The rationale behind this S-L design project is to relate the course content to the way elementary school students understand these engineering and scientific concepts. By having to present it to elementary school students, you will have to break it down and reduce it to the appropriate level of comprehension. Through this exercise you will be able to enhance your own understanding of the course materials.

- Semester Design Project: Students will be divided into random groups of 2-3 students, and each group will design, develop, and present a biofuel or a biobased experimental project.
- Subsequently, each group will have simplify their project in order to be utilized in K-12 science education (target grades to be determined), i.e. bioethanol, biodiesel, biogas, bioplastics, etc. The project will include lecture materials, problems/solved problems, and a hands-on exercise. The topic must be approved by September 9th, 2013. You are expected to complete all design assignments (with the exception of the final presentations) by November 20th.
- Each group will be provided with the course materials (lecture notes, presentations, problems, and lab handouts) covering their respective topics immediately after the projects are assigned.

Course Policies

- 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. You will be graded not only on the results, but also on style (you do get style points for well organized homework). Same is true for project reports.
- **Exams** will be closed book, but divided into two sections: theory and problems. Each student will be allowed a single page, handwritten with equations. As you are currently learning to think on your own feet, the exam problems will not necessarily be carbon copies of homework and example problems. NO CELLPHONES, IPODS, IPADS, LAPTOPS, or any other electronic devices are allowed at any time. All calculators will be handed to the instructor or proctor until the theory portion of the exam is turned in, at which time the calculator can be retrieved and used for the problems section.
- **Examinations** missed due to an unexcused absence cannot be made up and a grade of zero will be given for each one missed.
- Any student requiring **special arrangements** for taking exams, taking-notes and other special needs please see or contact the instructor within the first two weeks of class.
- Please refer to the Center for Academic Success for additional academic help related to time management and learning styles (http://appl003.lsu.edu/slas/cas.nsf/index). It helps identifying your strengths and weaknesses in learning.

I am available for questions outside of class. Please stop by my office if you need my help, even if outside office hours. If I am busy and do not have time to meet with you, I will tell you and we can schedule a meeting at another time. If you have trouble finding me, or our schedules do not coincide, you can make an appointment by either Email (dboldor@agcenter.lsu.edu) or Phone. If we make an appointment and you cannot attend, please call and cancel as soon as you can.

Academic Integrity and Academic Misconduct

Students are expected to comply with the Code of Student Conduct at all times throughout this course. For your information, the Code of Student Conduct can be found at
http://appl003.lsu.edu/slas/dos.nsf/$Content/Code+of+Conduct?OpenDocument

Grading policy: Grades will be determined based on the following breakdown:

Mid-term Exam	25 % (A1)
Final Exam	30 % (A2)
Homework (both content and presentation – writing skills)	15 % (A3)
Project Design	20 % (A4)
S-L Project Performance	10 % (A5)

To calculate your grade: Grade = A1*0.25 + A2*0.30 + A3*0.15 + A4*0.20 + A5*0.10

Grade Assignments:

A:	> 90	B:	80-89.9		
C:	70-79.9	D:	60-69.9	F:	< 60

Tentative Topics (it may change):

Lecture No.	Topics	
1	Introduction to syllabus	
2	Overview of mass and energy balance	
3	Organic chemistry- basic functional groups Carbohydrates	
4	Ligno-cellulosic	
5	Starches	
6	Oils and fats	
7	Resource base (chapter 3)	
8	Production of feedstock and properties(PHA ,PHB)	
9	Oil production from algae	
10	Post harvest treatment(drying, size reduction, densification, storage)	
11	Logistics and transport	
12	Products (butanol, hydrogen production, jet fuels) chapter 5.3, 5.4, 5.5	
13	Combustion Anaerobic digestion	
14, 15, 16	Thermo chemical Processes : Gasification, Pyrolysis, Liquefaction	
17	Pretreatment, fermentation of sugar and starches Ethanol combustion	
18,19	Lipid extraction and fermentation	
20,21	Biochemical conversion	
22	Transesterification (acid, base, enzymatic catalyst) Oil extraction	
23	Jet fuel production (cracking)	
24	Environmental impact	
25	Economics	
26, 27	Specialty chemical production	
28,29	Marketing policies, politics; global impact: economical and political	