

COURSE SYLLABUS
BIOFUELS
3 credits

Semester/year: Summer 2014

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1. **Course Description:** This is an introductory course focusing on the scope of combustion fuels made from nonpetroleum sources (biofuels). The source, processing, and social impacts of biofuel utilization will be covered.
2. **Pre-requisites:** General biology and chemistry background is helpful.
3. **Required Textbooks and Supplies:** AgrowKnowledge/Pioneer PowerPoint series, Soil Quality and BioFuel Production (ISBN:9781439800737) and lab guide.
4. **List pre-requisite skills:** College-level English, math, and computer competency for Internet searches and report preparation.
5. **Course Objectives:** Students will be able to describe:
 - How petroleum and bio-based fuels affect the global carbon cycle
 - The attributes of biofuels that make them suitable as a fuel for a specific application
 - Limitations of biofuels
 - Global impacts of biofuels on food and energy supplies
 - Technological advances and challenges to be overcome for wide-scale biofuel adoption
6. **Outcomes Assessment:** Mastery of the subject matter will be evaluated through written exams, quizzes, homework assignments, and computation-based laboratory exercises. A grade of 70% indicates the student generally understands the concepts presented.
7. **Policies and Procedures:**
 - Exams will be closed book and incorporate a variety of testing techniques; essay, multiple choice, true/false, matching, and fill-in-the-blank questions.
 - Quizzes will be closed book.
 - Homework assignments will be due at the start of class on the day indicated on the syllabus.
 - Cheating, dishonesty, and plagiarism will result in a penalty outlined in your college's student handbook or in the ethics statement.

8. **Grading Practices:**

Quizzes	8 x 10 pts. =	80	<u>Percentage</u>	<u>Grade</u>
Exams	3 x 100 pts. =	300	90-100%	A
Homework	5 @ 20 pts. =	100	80-89%	B
<u>Lab Assn.</u>	<u>14@20 pts. =</u>	<u>280</u>	70-79%	C
TOTAL		760	60-69%	D
			< 60%	F

9. **Library and Internet:** You will be required to do reading and conduct Internet reviews outside of class.

Topical Outline for the Course			
Week	Classroom Lecture	Lab	Due
1	Topic 1. Carbon in Our Environment		
	Topic 2. Introduction to Biofuels		
	LAB 1	1 Carbon Footprint	
2	Topic 3. Combustion Engines Part 1. Parts and Function		Quiz 1 Carbon and Introduction to Biofuels
	Topic 3. Combustion Engines Part 2. Turbines and Fuel Ratings		Worksheet 1 Chemistry of Petroleum
	LAB 2	2 Combustion Engines	
3	Topic 4. Alcohol Fuels Part 1. Attributes and History		Quiz 2 Combustion Engines
	Topic 4. Alcohol Fuels Part 2. Characteristics		
	LAB 3	3 Energy Value of Fuels	
4	Topic 4. Alcohol Fuels Part 3. Ethanol Production		Quiz 3 Alcohol Fuel Attributes and Characteristics
	Topic 4. Alcohol Fuels Part 4. Cellulosic Ethanol and Methanol		
	LAB 4	4 Yeast Respiration	
5	Topic 4. Alcohol Fuels Part 5. Butanol		Quiz 4 Production and Cellulose
	Topic 4. Alcohol fuels Part 6. Reports and Discussion		Worksheet 2 Ethanol Ethics Reports and Discussion
	LAB 5	5 Enzymes and Fermentation	
6	Exam 1		Introduction, Carbon, Engines and Alcohol
	Topic 5. Biodiesel Part 1. Petrodiesel		
	LAB 6	6 Proof and Distillation	

7	Topic 5. Biodiesel Part 2. Terms and Properties		
	Topic 5. Biodiesel Part 3. Making Biodiesel		Quiz 5 Petrodiesel. and Terms
	LAB 7	7 Making Biodiesel in the Lab with New Oil	
8	Topic 5. Biodiesel Part 4. Oil Sources		Worksheet 3 Food and Fuel
	Topic 5. Biodiesel Part 5. Straight Vegetable Oil (SVO)		Quiz 6 Making Biodiesel and SVO
	LAB 8	8 Making Biodiesel with Alternative Recipes I	
9	Topic 5. Biodiesel Part 6. Co-uses for Oilseed		
	Topic 5. Biodiesel Part 6. Second day		
	LAB 9	9 Building an Oilseed Press	
10	Exam 2		Biodiesel
	Topic 6. Gasification Part 1. Biomass		Worksheet 4 Biodiesel and Ethanol Comparisons
	LAB 10	10 Biomass Measurement	
11	Topic 6. Gasification Part 2. Producer Gas		
	Topic 7. Biogas Part 1. Biology		Quiz 7 Gasification
	LAB 11	11 Biogas	
12	Topic 7. Biogas Part 2. Feed Selection		
	Topic 7. Biogas Part 3. Fuel Value and Properties		
	LAB 12	12 Livestock Waste Management	
13	Topic 7. Biogas Part 4 Uses		Quiz 8 Biogas
	Topic 8. Mariculture Part 1. Algae Propagation		Worksheet 5 Biogas
	LAB 13	13 Aquatic Vegetation	
14	Topic 8. Mariculture Part 2. Fuel Conversion and Future Technology		
	Semester Review		
	LAB 14	14 Poster Presentation	
15	Exam 3		Gasification, Biogas, Mariculture, Fuel Cells