



Course Syllabus: Clean Fossil Fuels and Biofuels - CBE 317

Division	Physical Science and Engineering Division
Course Number	CBE 317
Course Title	Clean Fossil Fuels and Biofuels
Academic Semester	Spring
Academic Year	2016/2017
Semester Start Date	01/22/2017
Semester End Date	05/18/2017
Class Schedule (Days & Time)	01:00 PM - 02:30 PM Sun Thu

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Klaus-Victor Georg Peinemann	klausvictor.peinemann@kaust.edu.sa	+966128082257	4222, 4, Al-Jazri (bldg. 4)	

Teaching Assistant(s)	
Name	Email

Course Information	
Comprehensive Course Description	<p>The "Biofuel" part of this course includes description of the different "generations" of biofuels: 1. biofuels from sugars, starches, vegetable and animal oils 2. biofuels from non-food crops like ligno-cellulose 3. biofuels from algae 4. biofuels from specially engineered plants. Lectures include biomass feedstocks, fuels from cellulose, bioethanol, biobutanol, biodiesel, algae biofuel, biogas, microbial fuel cells. Students will learn to calculate the energy balance of biofuel production.</p> <p>The "Clean Fossil Fuel" part of the course includes gasification processes, advanced power plant concepts (IGCC, NGCC), Fischer-Tropsch synthesis, gas to liquid processes (GTL), carbon dioxide capture and storage, desulfurization processes.</p>
Course Description from Program Guide	<p>The different types of biofuels will be presented and discussed in this course. Topics include biomass feedstocks, first, second and third generation of biofuels, fuel from cellulose, catalytic conversion of biomass to liquid, energy balance of biofuels, biological production of hydrogen, biodiesel, microbial fuel cells. The Clean Fossil Fuel part of this course deals with gasification processes including IGCC power plants, Fischer Tropsch synthesis, clean coal technologies, desulfurization and carbon dioxide capture and storage</p>
Goals and Objectives	<p>Students know details biofuel production, they can calculate energy balance of biofuel production</p> <p>students know principles and thermodynamics of gasification processes</p> <p>students know advanced power plants concepts (IGCC, chemical looping)</p> <p>students know details of gas-to-liquid processes, Fischer Tropsch process</p> <p>students know details of carbon dioxide capture and storage, they can calculate energy requirement</p> <p>students know details of desulfurization process</p>
Required Knowledge	undergraduate thermodynamics, basic chemistry knowledge
Reference Texts	<p>C. M. Drapcho, N. P. Nguan, T. Walker, Biofuel Engineering Process Technology, Mc Graw Hill 2008</p> <p>D. M. Mousdale, Biofuels, CRC Press 2008</p> <p>A. Zuettel, A. Borgschulte, L. Schlapbach, Hydrogen as a Future Energy Carrier, Wiley-VCH 2008</p>

Method of evaluation	30.00% - Exam 2 20.00% - Oral presentation 20.00% - Homework /Assignments 30.00% - Exam 1
Nature of the assignments	2 written homeworks 1 oral presentation
Course Policies	<p>Attendance Policy Every student is expected to attend all scheduled class sessions, including mid-term and final exam.</p> <p>Cell Phone and Lap Top and Ipad Policy:</p> <p>-All cell phones must be turned off. Electronic devices of any sort — computers and the like — are only to be in class and turned on when I indicate. Otherwise, they will not be present in this class.</p> <p>Class will be canceled if the university is closed or I am otherwise prevented from attending. If class is canceled because I cannot be here -- and the university is otherwise open -- you will be notified through your e-mail.</p>
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Sun 01/22/2017 Thu 01/26/2017	Biomass feedstocks
2	Sun 01/29/2017 Thu 02/02/2017	Bio-ethanol, bio-butanol
3	Sun 02/05/2017 Thu 02/09/2017	Fuel from cellulose 1
4	Sun 02/12/2017 Thu 02/16/2017	Fuels from cellulose 2
5	Sun 02/19/2017 Thu 02/23/2017	Biodiesel
6	Sun 02/26/2017 Thu 03/02/2017	Biofuel from Algae
7	Sun 03/05/2017 Thu 03/09/2017	Biogas
8	Sun 03/12/2017 Thu 03/16/2017	Microbial fuel cells
9	Sun 03/19/2017 Thu 03/23/2017	Mid-term test
10	Sun 03/26/2017 Thu 03/30/2017	Gasification processes
11	Sun 04/02/2017 Thu 04/06/2017	Advanced power plant concepts (IGCC)
12	Sun 04/09/2017 Thu 04/13/2017	Fischer-Tropsch synthesis, gas to liquid processes
13	Sun 04/16/2017 Thu 04/20/2017	Carbon dioxide capture and storage 1
14	Sun 04/23/2017 Thu 04/27/2017	Carbon dioxide capture and storage 2
15	Sun 04/30/2017 Thu 05/04/2017	Chemical Looping
16	Sun 05/07/2017 Thu 05/11/2017	Desulfurization
17	Sun 05/14/2017 Thu 05/18/2017	Student presentation
18		Repitition

Note

The instructor reserves the right to make changes to this syllabus as necessary.