



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	2017/2018
Semester Start Date	01/28/2018
Semester End Date	05/24/2018
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. Nhuan, 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% - Final exam 20.00% - Oral presentation 30.00% - Midterm exam 20.00% - Homework /Assignments
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 style="padding-left: 40px;">-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 01/28/2018	Biomass feedstocks, bioethanol production
1	Thu 02/01/2018	bioethanol purification process
2	Sun 02/04/2018	fuel from cellulose
2	Thu 02/08/2018	fuel from cellulose 2
3	Sun 02/11/2018	biobutanol, energy balance of biofuel production
3	Thu 02/15/2018	Algae biofuel
4	Sun 02/18/2018	algae biofuel 2
4	Thu 02/22/2018	biogas, biological production of hydrogen
5	Sun 02/25/2018	student presentations
5	Thu 03/01/2018	microbial fuel cells
6	Sun 03/04/2018	artificial photosynthesis
6	Thu 03/08/2018	repetition
7	Sun 03/11/2018	mid-term test
7	Thu 03/15/2018	sustainability analysis of biofuels
8	Sun 03/18/2018	student presentations
8	Thu 03/22/2018	coal gasification processes
9	Sun 03/25/2018	Advanced power plant concepts (IGCC, NGCC, Chemical looping)
9	Thu 03/29/2018	Advanced power plant concepts 2
10	Sun 04/01/2018	spring break
10	Thu 04/05/2018	spring break
11	Sun 04/08/2018	Fischer-Tropsch process, GTL processes
11	Thu 04/12/2018	student presentations
12	Sun 04/15/2018	carbon dioxide capture from air, thermodynamic analysis
12	Thu 04/19/2018	carbon dioxide capture from power plants
13	Sun 04/22/2018	student presentations
13	Thu 04/26/2018	desulfurisation processes
14	Sun 04/29/2018	desulfurisation processes 2
14	Thu 05/03/2018	chemical looping 2
15	Sun 05/06/2018	student presentations
15	Thu 05/10/2018	student presentations
16	Sun 05/13/2018	student presentations
16	Thu 05/17/2018	repetition
17	Sun 05/20/2018	repetition
17	Thu 05/24/2018	final test

Note

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