ENERGY SCIENCE AND TECHNOLOGY BACHELOR PROGRAM

Course Details

Code	Academic Year			Semester
EBT415	4			8
Title	**T**	**A**	**L**	**ECTS**
Clean Combustion Technologies	3	2	0	6

Language	German					
Level	**Undergraduate**	x	**Graduate**		**Postgraduate**	
Department / Program	Energy Science and Technology					
Forms of Teaching and Learning	Formal					
Course Type	**Compulsory**	**X**	**Elective**			
Objectives	1. Explaining that fossil fuels can be used without harming the environment. 2. Introduction of clean combustion technologies for fuels. 3. To train human resources who can carry out R&D studies aiming to realize the transformation of energy resources in an efficient way in terms of total benefit.					
Content	It is aimed to introduce different technologies that will enable the use of fossil fuels in a way that causes the least harm to the environment. By considering these technologies separately, zero emission power cycles, catalytic combustion techniques and fluidized bed systems will be explained. Technologies related to the reduction of post-combustion emissions will also be given in the course.					
Prerequisites						
Coordinator						
Lecturer(s)						
Assistant(s)						
Work Placement	No					

Recommended or Required Reading

Books / Lecture Notes	1) Yantovski, E, P. Gorski, Shokotov, M, Zero Emission PowerPlants, Taylor and Francis, 2009. 2) Jaccard, M., Sustainable Fossil Fuels, Cambridge University Press, 2006. 3) Simeon, NO, E.J. Anthony, Fluidized Bed Combustion, Marcell Dekker Inc., 2004) Hayes, R.E., S.T. Kolaczkowski, Introduction to Cathalytic Combustion,, Gordon and Breach Science Publishers, 1997.
Other Sources	

Additional Course Material

Documents	
Assignments	
Exams	1 Midterm exam-1 Final

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Course Composition		
Mathematics und Basic Sciences		%
Engineering	20	%
Engineering Design		%
Social Sciences		%
Educational Sciences		%
Natural Sciences	20	%
Health Sciences		%
Expert Knowledge	60	%

Assessment		
Activity	**Count**	**Percentage (%)**
Midterm Exam	1	40
Quiz		
Assignments		
Attendance		
Recitations		
Projects		
Final Exam	1	60
	Total	**100**

ECTS Points and Work Load			
Activity	**Count**	**Duration**	**Work Load (Hours)**
Lectures	14	3	42
Self-Study	14	3	42
Assignments			
Presentation / Seminar Preparation			
Midterm Exam	1	2	2
Recitations			
Laboratory			
Projects			
Final Exam	1	2	2
		Total Work Load	**88**
		ECTS Points (Total Work Load / Hour)	**6**

Learning Outcomes	
1	To be able to use basic knowledge about thermodynamics, power cycles and combustion.
2	To be able to express the problems related to the transformation of energy sources.

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3	Understand systems such as zero emission power cycles, techniques such as catalytic combustion and fluidized bed.
4	To be able to follow basic researches on designs that provide efficient conversion of energy resources in terms of total utility.

Weekly Content	
1	Definitions of sustainability, efficiency, effectiveness.
2	Fossil Fuel Types
3	Basics of combustion
4	Combustion kinetics
5	Power cycles
6	Limitation of contaminants during incineration
7	Control of air/fuel ratio
8	Temperature control
9	Catalytic combustion
10	Zero emission power cycle examples
11	Development of fluidized bed boilers
12	Fundamentals of gas-solid fluidization
13	Heat and mass transfer in fluidized beds
14	Comparison of energy conversions in terms of total efficiency

Contribution of Learning Outcomes to Program Objectives (1-5)

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**
1							
2							
3							
4							
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6							
7							
8							
9							
10							
11							
12							

Contribution Level	1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High
Compiled by:	
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