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	The aim of this course is to introduce clean combustion technologies that enable the efficient use of fossil fuels while minimizing their environmental impacts.					
Content	Within the scope of the course, clean combustion technologies developed for gas and steam turbines will be thoroughly examined. Contemporary technologies such as zero-emission power cycles, catalytic combustion methods, and fluidized bed combustion systems will be analyzed in detail. In addition, renewable energy systems and clean fossil fuel utilization technologies will be comparatively evaluated in terms of overall energy efficiency.					
Prerequisites						
Coordinator						
Lecturer(s)						
Assistant(s)						
Work Placement	No					

Recommended or Required Reading

Books / Lecture Notes	Nemitallah, Medhat A., Ahmed A. Abdelhafez, and Mohamed A. Habib. *Approaches for clean combustion in gas turbines*. Springer, 2020. Yantovski, E, P. Gorski, Shokotov, M, *Zero Emission PowerPlants*, Taylor and Francis, 2009. Jaccard, M., *Sustainable Fossil Fuels*, Cambridge University Press, 2006. 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	

ENERGY SCIENCE AND TECHNOLOGY BACHELOR PROGRAM

Assignments		
Exams		
Course Composition		
Mathematics und Basic Sciences	10	%
Engineering	20	%
Engineering Design		%
Social Sciences		%
Educational Sciences		%
Natural Sciences	20	%
Health Sciences		%
Expert Knowledge	50	%

Assessment		
Activity	**Count**	**Percentage (%)**
Midterm Exam	1	40
Quiz		
Assignments	1	10
Attendance		
Recitations		
Projects		
Final Exam	1	50
	Total	**100**

ECTS Points and Work Load			
Activity	**Count**	**Duration**	**Work Load (Hours)**
Lectures	14	3	42
Self-Study	14	6	84
Assignments	1	10	10
Presentation / Seminar Preparation			
Midterm Exam	1	2	2
Recitations	14	2	28
Laboratory			
Projects			
Final Exam	1	2	2
		Total Work Load	**168**
		ECTS Points (Total Work Load / Hour)	**6**

Learning Outcomes

ENERGY SCIENCE AND TECHNOLOGY BACHELOR PROGRAM

1	Students will acquire in-depth knowledge of the fundamentals of thermodynamics, power cycles, and combustion.
2	Students will learn to analyze problems related to the conversion of energy sources.
3	Students will learn about systems such as zero-emission power cycles, and techniques such as catalytic combustion and fluidized beds.
4	Students will gain the ability to understand research related to designs that enable efficient conversion of energy sources in terms of overall benefit.

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	Midterm exam
9	Temperature control
10	Catalytic combustion
11	Zero emission power cycle examples
12	Development of fluidized bed boilers
13	Fundamentals of gas-solid fluidization
14	Heat and mass transfer in fluidized beds
15	Comparison of energy conversions in terms of total efficiency
16	Final exam

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

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**
1	4	3	4	3	3	3	3
2	4	3	4	3	3	3	3
3	4	3	4	3	3	3	3
4	4	3	4	3	3	3	3

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