DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGY
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
EBT411	4			8
Title	**T**	**A**	**L**	**ECTS**
Energy Systems Modeling and Simulation	2	1	0	6

Language	German					
Level	**Undergraduate**	**X**	**Graduate**		**Postgraduate**	
Department / Program	Energy Science and Technology					
Forms of Teaching and Learning	Face-to-face					
Course Type	**Compulsory**		**Elective**	**X**		
Objectives	Students who successfully complete this course will be able to apply fundamental principles of modeling and simulation. They will be able to implement statistical and theoretical modeling techniques. They will be able to use various computer programs for modeling and simulation. They will be able to create models using concepts from heat transfer, mass transfer, fluid mechanics, and thermodynamics. They will also be able to use various optimization techniques for solving engineering problems.					
Content	This course aims to introduce the topics of modeling, simulation, and optimization; to teach various statistical and theoretical modeling techniques; and to enable students to conduct modeling and simulation using various computer programs. The focus is on modeling and simulating problems in energy systems. Topics covered include: statistical methods; simple linear regression; polynomial regression; multiple linear regression; theoretical models based on heat transfer, mass transfer, fluid mechanics, and thermodynamics; and various optimization techniques.					
Prerequisites	None					
Coordinator						
Lecturer(s)						
Assistant(s)						
Work Placement	None					

Recommended or Required Reading	
Books / Lecture Notes	Probability & Statistics for Engineers & Scientists (9th Edition) – Walpole, ISBN 978-0-321-62911-1, Data Mining Methods and Models, Daniel T. Larose, Wiley, ISBN-13 978-0-471-66656-1, Discovering Knowledge in Data, Daniel T. Larose, Wiley, ISBN 0-471-66657-2
Other Sources	

Additional Course Material	
Documents	

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Assignments		
Exams		

Course Composition

Mathematics und Basic Sciences		%
Engineering	40	%
Engineering Design	40	%
Social Sciences		%
Educational Sciences		%
Natural Sciences		%
Health Sciences		%
Expert Knowledge	20	%

Assessment

Activity	Count	Percentage (%)
Midterm Exam	1	30
Quiz		
Assignments		
Attendance		
Laboratory		
Projects	1	20
Final Exam	1	50
	Total	**100**

ECTS Points and Work Load

Activity	Count	Duration	Work Load (Hours)
Lectures	14	2	28
Self-Study	14	5	70
Assignments	4	13	52
Presentation / Seminar Preparation			
Midterm Exam	1	2	2
Recitations	14	1	14
Laboratory			
Projects			
Final Exam	1	2	2
		Total Work Load	**168**
		ECTS Points (Total Work Load / Hour)	**6**

Learning Outcomes

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1	Students can create mathematical and statistical models of energy systems.
2	Students can develop physical models by applying principles of thermodynamics, fluid mechanics, and heat and mass transfer.
3	Students can effectively use computer programs for modeling and simulation.
Weekly Content	
1	Introduction to modeling and simulation
2	Introduction to statistical methods
3	Simple linear regression
4	Polynomial regression
5	Multiple linear regression
6	Theoretical modeling for energy systems
7	Thermodynamics-based modeling
8	Midterm Exam
9	Thermodynamics-based modeling
10	Applications of fluid mechanics
11	Heat and mass transfer-based modeling
12	Heat and mass transfer-based modeling
13	Computer-aided simulation software
14	Introduction to optimization techniques
15	Optimization applications in energy systems
16	Final Exam

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

	P1	P2	P3	P4	P5	P6	P7	P8	P9
Ö1	5	4		3		5	5		
Ö2	4	5		5		4	3		
Ö3	5	4		4		5	4		

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

Compiled by:	
Date of Compilation:	

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