DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGIES
COURSE SYLLABUS

Course Details									
Code						**Academic Year**			**Semester**
EBT320						3			6
Title						**T**	**A**	**L**	**ECTS**
Advanced Quantum Energy Systems						3	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	The main aim of the course to investigate quantum information systems.								
Content	Quantum correlations, Quantum circuits, Quantum noise and Quantum operations, Distance Measures for Quantum İnformation								
Prerequisites	None								
Coordinator	Asst. Prof. Elif Yunt								
Lecturer(s)	Asst. Prof. Elif Yunt								
Assistant(s)									
Work Placement	None								

Recommended or Required Reading	
Books / Lecture Notes	Thermodynamics in the Quantum Regime-Fundamental Aspects and New Directions, Felix Binder, Luis A. Correa, Gerardo Adesso, Fundamental Theories in Physics 195, Springer Quantenmechanik: Einführung, W. Greiner Thermodynamik und Statistische Mechanik, W. Greiner
Other Sources	Quantum Computation and Quantum Information, Micheal A. Nielsen and Isaac L. Chuang Quantum Thermodynamics: Emergence of Thermodynamic Behavior Within Composite Quantum Systems, Jochen Gemmer, M. Michel, G. Mahler,Lecture Notes in Physics, 2nd Ed. Springer

Additional Course Material	
Documents	
Assignments	
Exams	

Course Composition		
Mathematics und Basic Sciences		%
Engineering	50	%

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Engineering Design		%
Social Sciences		%
Educational Sciences		%
Natural Sciences	50	%
Health Sciences		%
Expert Knowledge		%

Assessment

Activity	Count	Percentage (%)
Midterm Exam	1	30
Quiz	4	20
Assignments	2	10
Attendance		
Recitations		
Projects		
Final Exam	1	40
	Total	**100**

ECTS Points and Work Load

Activity	Count	Duration	Work Load (Hours)
Lectures	14	5	70
Self-Study	14	7	98
Assignments	2	4	8
Presentation / Seminar Preparation			
Midterm Exam	1	2	2
Recitations			
Laboratory			
Projects			
Final Exam	1	2	2
		Total Work Load	**194**
		ECTS Points (Total Work Load / Hours)	**6**

Learning Outcomes

1	To gain an understanding of quantum physics
2	To gain an understanding of quantum correlations and entanglement
3	To learn how the laws of quantum physics are applied in quantum information theory.
4	To learn how quantum circuits function.
5	To learn to evaluate energetic processes in the quantum regime

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6	To learn how quantum correlations are used as resources in the quantum information theory
Weekly Content	
1	Fundamentals: Probability Theory and Linear Algebra
2	Vector Formalism I
3	Vector Formalism II
4	Postulates of Quantum Theory I
5	Postulates of Quantum Theory II
6	Density matrix theory
7	Quantum Correlations and Entanglement Measures
8	Midterm
9	Introduction to quantum information theory
10	Quantum correllations
11	Quantum circuits
12	Quantum noise
13	Quantum Operations
14	Distance Measures of quantum information theory
15	Energy perspective of quantum information systems

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

	P1	P2	P3	P4	P5	P6	P7	P8	P9
1	5	5	5	5	5	5	5	5	5
2	5	5	5	5	5	5	5	5	5
3	5	5	5	5	5	5	5	5	5
4	5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5

Contribution Level	1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High
https://obs.tau.edu.tr/oibs/bologna/progLearnOutcomes.aspx?lang=EN&curSunit=5706	
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