DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGY
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
EBT302	3			5
Title	**T**	**A**	**L**	**ECTS**
Numerical Analysis	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**	**X**	**Elective**			
Objectives	This course aims to use computer programs to solve complex problems in different fields of study of students.					
Content	Computer Arithmetic, Error Analysis, Systems of Linear Equations, Matrix Factorization, Systems of Nonlinear Equations, Newton's Method, Banach Fixed Point Theorem, Ordinary Differential Equations, Eigenvalue Problems. After completing the course, students understand the concepts of numerical functions, optimization and theories of complex functions.					
Prerequisites	None					
Coordinator						
Lecturer(s)						
Assistant(s)						
Work Placement	None					

Recommended or Required Reading	
Books / Lecture Notes	Dahmen & Reusken: Numerik für Ingenieure und Naturwissenschaftler, Springer-Verlag, 2008. Schwarz & Köckler: Numerische Mathematik, Vieweg+Teubner, 8. Auflage, 2011.
Other Sources	

Additional Course Material	
Documents	
Assignments	
Exams	

Course Composition		
Mathematics und Basic Sciences	70	%
Engineering	30	%
Engineering Design		%

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Social Sciences		%
Educational Sciences		%
Natural Sciences		%
Health Sciences		%
Expert Knowledge		%

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	3	15	45
Self-Study	15	3	45
Assignments	5	2	10
Presentation / Seminar Preparation			
Midterm Exam	1	3	3
Recitations	15	2	30
Laboratory			
Projects	1	15	15
Final Exam	1	3	3
		Total Work Load	**151**
		ECTS Points (Total Work Load / Hour)	**6**

Learning Outcomes

1	Students gain the ability to make numerical solutions.
2	They gain the ability to use their mathematical knowledge, establish and solve mathematical models.
3	They gain the ability to produce solutions to complex problems that are difficult or impossible to solve analytically, using simple arithmetic operations.
4	They acquire the ability to analyze the accuracy and stability of methods.
5	
6	

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Weekly Content	
1	Mathematical Preliminaries
2	Solution of nonlinear equations
3	Solution of nonlinear equations
4	Interpolation and polynomial approximation
5	Interpolation and polynomial approximation
6	Inverse interpolation and Curve fitting
7	Curve fitting
8	Midterm
9	Solution of systems of linear equations
10	Solution of systems of linear equations
11	Numerical Derivation and integration
12	Numerical Derivation and integration
13	Numerical Derivation and integration
14	Numerical Solutions of Nonlinear Systems of Equations
15	Finals

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

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

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

P1 Working with modern scientific sources.
P2 Having modern scientific knowledge and scientific analysis abilities and being able to apply them to scientific problems.
P3 Having theoretical and practical skills in the area of Energy Science and Technology.
P4 Having foreign language skills to follow the worldwide advancements in the field of Energy Science and Technology and to be able to discuss them with foreign colleagues.
P5 Having computational skills for research data analysis purposes.
P6 Having appropriate skills for academic and industrial jobs, being ready to take responsibility in working life.
P7 Having knowledge about work occupational work and safety.

Compiled by:	
Date of Compilation:	29.08.2022