DEPARTMENT OF MECHATRONICS ENGINEERING
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
MEC449	4			7
Title	**T**	**A**	**L**	**ECTS**
Smart Materials Project 3	1	0	5	6

Language	German					
Level	**Undergraduate**	✓	**Graduate**		**Postgraduate**	
Department / Program	Mechatronics Engineering					
Forms of Teaching and Learning	Face to face					
Course Type	**Compulsory**		**Elective**	✓		
Objectives	Smart materials can notice environmental alterations and react against them with a prespecified response. They can change shape or behavior under water, pressure, heat, and light. Examples include 4D-printed shape-memory polymer grippers and polymers that can recover their shape at a high temperature. In 4D printing, the new dimension is time, and the 3D prints change behavior with time. 4D technology uses programmable and advanced materials. Therefore, students should learn those novel technologies equipped with advanced materials.					
Content	In this module, students can learn about smart materials and their production and applications in intelligent systems. The workload of this Project lecture is divided into three semesters as follows: Semester 1: Learning the basics of smart materials and planning the Project Semester 2: Fabrication of the smart materials via 4D printing Semester 3: Characterization of the smart materials properties					
Prerequisites	MEC207 Material Technology 1					
Coordinator	Asst. Prof. Dr. Ali Can KAYA					
Lecturer(s)	Asst. Prof. Dr. Ali Can KAYA					
Assistant(s)	M.Sc. Mustafa Hakan Sandık					
Work Placement						

Recommended or Required Reading	
Books / Lecture Notes	• Suong V. Hoa, 4D Printing of Composites, de Gruyter, 2024
Other Sources	• Lecture Slides

Additional Course Material	
Documents	
Assignments	1
Exams	1 Midterm exam, 1 final exam

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Course Composition		
Mathematics und Basic Sciences	10	%
Engineering	50	%
Engineering Design	10	%
Social Sciences		%
Educational Sciences		%
Natural Sciences	30	%
Health Sciences		%
Expert Knowledge		%

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

ECTS Points and Work Load			
Activity	**Count**	**Duration**	**Work Load (Hours)**
Lectures	14	6	84
Self-Study			
Assignments			
Presentation / Seminar Preparation	2	12	24
Midterm Exam			
Recitations			
Laboratory			
Projects	1	100	100
Final Exam			
		Total Work Load	**208**
		ECTS Points (Total Work Load / Hour)	**6**

Learning Outcomes	
1	The students know the lightweight materials.
2	They know the relationships between the alloy composition and their mechanical properties.

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3	They can characterize the cellular structures.
4	They can distinguish the alloys, ceramics, polymers, and their application fields in mechanical engineering.
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12	

Weekly Content	
1	Introduction to the Lightweight materials
2	Alloys in mechanical engineering
3	Alloys in mechanical engineering
4	Mechanical properties of alloys
5	Physical properties of alloys
6	Cellular structures
7	Mechanical properties of cellular structures
8	Midterm exams
9	Physical properties of cellular structures
10	Characterization methods of the alloys
11	Polymers
12	Ceramics
13	Composite materials
14	Characterization methods of the Polymers, ceramics, composites
15	Repetition and exam preparation

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

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

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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
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Date of Compilation:	31.03.2024