DEPARTMENT OF MECHATRONICS ENGINEERING
COURSE SYLLABUS

Course Details				
Code		**Academic Year**		**Semester**
MEC207		3		Fall
Title	**T**	**A**	**L**	**ECTS**
Material Technology 1	3	1	1	6

Language	German					
Level	**Undergraduate**	**X**	**Graduate**		**Postgraduate**	
Department / Program	Mechatronics Engineering					
Forms of Teaching and Learning	Face-to-Face					
Course Type	**Compulsory**	**X**	**Elective**			
Objectives	Main objectives of this lecture are to introduce material technology and to provide interplay between thermodynamical processes and material microstructures.					
Content	• Introduction to materials science, • crystal structure, • defects in solids, • characterization of the microstructures, • phase diagrams, • transport, • phase transformations, • mechanical properties.					
Prerequisites	-					
Coordinator	Asst. Prof. Dr. Ali Can Kaya					
Lecturer(s)	Asst. Prof. Dr. Ali Can Kaya					
Assistant(s)	Ali Korucu, Mustafa Hakan Sandık					
Work Placement	-					

Recommended or Required Reading	
Books / Lecture Notes	• Materialwissenschaften und Werkstofftechnik Eine Einführung , William D. Callister, David G. Rethwisch, Michael Scheffler, Franziska Scheffler, Manja Krüger, Hans-Jörg Möhring , Wiley, 2020, ISBN: 9783527833221. • Werkstofftechnik Teil 1:Grundlagen, Wolfgang Bergmann, Hanser; Auflage: 7, 2013, ISBN: 9783446435360. • Engineering Materials Science, Milton Ohring, Academic Press, 1995. ISBN: 0-12-524995-0 . • Werkstofftechnologie für Ingenieure, James F. Shackelford, Pearson; Auflage: 6, ISBN: 3-8273-7159-7.

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	• Werkstofftechnik, Serope Kalpakjian, Steven R. Schmid, Ewald Werner, Pearson, 2011, ISBN: 9783868940060.
Other Sources	Lecture slides

Additional Course Material

Documents	-
Assignments	1
Exams	1 Midterm Exam, 1 Final Exam

Course Composition

Mathematics und Basic Sciences	10	%
Engineering	30	%
Engineering Design		%
Social Sciences		%
Educational Sciences		%
Natural Sciences	60	%
Health Sciences		%
Expert Knowledge		%

Assessment

Activity	Count	Percentage (%)
Midterm Exam	1	30
Quiz		
Assignments	1	10
Attendance		
Recitations		
Projects		
Final Exam	1	60
	Total	**100**

ECTS Points and Work Load

Activity	Count	Duration	Work Load (Hours)
Lectures	14	4	56
Self-Study			
Assignments	1	3	3
Presentation / Seminar Preparation			
Midterm Exam	1	8	8
Recitations	14	4	56

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Laboratory	14	2	28
Projects			
Final Exam	1	10	10
		Total Work Load	**161**
		ECTS Points (Total Work Load / Hour)	**6**

Learning Outcomes	
1	Basics of materials science
2	Acquiring knowledge about the material structures
3	Acquiring knowledge about the thermodynamical processes in materials science
4	Acquiring knowledge about the material properties
5	Experimental basis and interpretation of the results
6	Interdisciplinary learning skills
7	Ability to work in groups
8	
9	
10	
11	
12	

Weekly Content	
1	Introduction to Materials Science,
2	Structure and Bonding, Classification of materials
3	Crystal structure, lattices, closed pack structures
4	Reciprocal structure, diffraction
5	Defects in solids, point defects, dislocations, grain and phase boundaries
6	Characterization of the microstructure, microscopic methods (optical, SEM), diffraction techniques (XRD, TEM), scanning probe techniques (STM,AFM/MFM)
7	Phase diagrams, concept of equilibrium, basic thermodynamics: enthalpy, entropy, free energy
8	Basic types of binary phase diagrams, important examples : Cu-Ni, Pb-Sn, Fe-C
9	Transport, diffusion: macroscopic and microscopic description, diffusion at surfaces and interfaces, electromigration
10	Phase transformations, thermodynamics and kinetics,
11	diffusive transformations, non-diffusive transformations
12	Mechanical properties, elastic properties, plastic deformation,

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13	Viscous flow and creep, fracture
14	Advances in materials science
15	

Contribution of Learning Outcomes to Program Objectives (1-5)												
	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**
1	5	5	5	5	3	3	3					
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
Contribution Level			1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High									
https://obs.tau.edu.tr/oibs/bologna/index.aspx?lang=tr&curOp=showPac&curUnit=05&curSunit=5726#												
Compiled by:			Asst. Prof. Dr. Ali Can Kaya									
Date of Compilation			01.09.2022									