DEPARTMENT OF MATERIALS SCIENCE AND TECHNOLOGY
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
MWT205	2			3
Title	**T**	**A**	**L**	**ECTS**
Basics of Material Sciences	3	1		6

Language	German					
Level	**Undergraduate**	**X**	**Graduate**		**Postgraduate**	
Department / Program	Department of Material Science and Technology (German)					
Forms of Teaching and Learning	Face to Face					
Course Type	**Compulsory**		**Elective**	**X**		
Objectives	Learning the basic materials science and modern engineering materials; understanding the relationship between microstructure and material performance; gaining the background to design of suitable materials; Gaining the ability of solving engineering problems					
Content	Structure of materials (Atomic structure, crystal and amorphous structure, Miller indices, directions and planes in crystal structures, lattice defects in crystal structures); structures of pure metals and mixtures; diffusion; phase diagrams and transformations; mechanical behavior of materials: Elastic deformation, plastic deformation, fracture, creep, metal fatigue, viscosity, viscoelasticity; electronic and thermal properties of materials, thermal conductivity, thermal expansion					
Prerequisites	-					
Coordinator	-					
Lecturer(s)	Assoc. Prof. Dr. Ergün Keleşoğlu					
Assistant(s)	-					
Work Placement	-					

Recommended or Required Reading	
Books / Lecture Notes	Binnewies, Jäckel, Willner, Rayner-Canham, „Allgemeine und Anorganische Chemie“, Spektrum Akademischer Verlag (2010).
Other Sources	Hans Jürgen Bargel, Günter Schulze, Werkstoffkunde, Springer Verlag, 11. Auflage, 2012 Wolfgang Weißbach, Werkstoffkunde, Strukturen, Eigenschaften, Prüfung, Viebeg+Teubner Verlag, 17. Auflage, 2010. Erhard Hornbogen, Werkstoffe, Aufbau und Eigenschaften von Keramik-, Metall-, Polymerund Verbundwerkstoffen, Sprnger Verlag, 8. Auflage, 2005

Additional Course Material	
Documents	
Assignments	
Exams	

Course Composition

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Mathematics und Basic Sciences		%
Engineering		%50
Engineering Design		%
Social Sciences		%
Educational Sciences		%
Natural Sciences		%50
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	14	2	28
Self-Study	14	5	70
Assignments	5	10	50
Presentation / Seminar Preparation			
Midterm Exam	1	2	2
Recitations	14	2	28
Laboratory	14	1	14
Projects			
Final Exam	1	2	2
		Total Work Load	
		ECTS Points (Total Work Load / Hours)	

Learning Outcomes

1	The students develop a first understanding of the structural structure and properties of ideal crystals.
2	Comprehends the structure-property-process relationships in materials
3	Has knowledge of the mechanical behavior of materials, microstructure control and phase diagrams and transformations.

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4	Knows elastic and plastic deformation mechanisms
5	Understands the effect of deformation on material microstructure
6	Knows the methods of testing the mechanical properties of materials
7	Has knowledge about thermal and electrical properties of materials
8	
9	
10	
11	
12	

Weekly Content	
1	Structure of crystal materials (Inorganic substances bonding forms, ideal crystalline lattice structure, real crystals, lattice defects, energy of defects)
2	Structure of crystal materials (Cryristal lattice defects, dislocations, single-crystalline and multi-crystalline structures, grain sizes and shapes)
3	Properties of metals (Electrical and thermal properties)
4	Mechanical properties of metals (Elastic and plastic deformation)
5	Mechanical properties of metals (Plastic deformation mechanisms, ductility, solidification, flow curve)
6	Phase transformations (primary crystallization in pure metals, nucleation, crystal growth)
7	Phase transformations (primary crystallization in alloys, effect of grain boundaries, solid state transformations)
8	Phase transformations (Martensite formation, martensite in Fe-C alloys, shape memory alloys)
9	Fundamentals of heat treatment (Fick's law of diffusion, diffusion coefficient)
10	Fundamentals of heat treatment (recrystallization, creep, stress relaxation)
11	Foundations of alloy formation
12	Phase diagrams of alloys (Full solubility and solubility concepts in liquid and solid states)
13	Phase diagrams of alloys (eutectic and peritectic systems)
14	Corrosion (types of corrosion, chemical corrosion, mechanical corrosion)
15	

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

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**
1			3		1	2		
2								
3								
4								
5								
6								
7								

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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/progLearnOutcomes.aspx?lang=en&curSunit=207	
Compiled by:	Res. Asst. Burak Evren
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