DEPARTMENT OF MATERIALS SCIENCE AND TECHOLOGY
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
MWT205	2			3
Title	**T**	**A**	**L**	**ECTS**
Basics of Material Sciences	3	1	0	6

Language	German					
Level	**Undergraduate**	**X**	**Graduate**		**Postgraduate**	
Department / Program	Materials Science and Technology					
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)	Asist Prof.Dr. Duygu Ekinci					
Assistant(s)						
Work Placement	No					

Recommended or Required Reading	
Books / Lecture Notes	Binnewies, Jäckel, Willner, Rayner-Canham, „Allgemeine und Anorganische Chemie“, Spektrum Akademischer Verlag (2010). 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
Other Sources	

Additional Course Material	
Documents	
Assignments	
Exams	

DEPARTMENT OF MATERIALS SCIENCE AND TECHOLOGY
COURSE SYLLABUS

Course Composition		
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	5	20
Attendance		
Recitations		
Projects		
Final Exam	1	40
	Total	**100**

ECTS Points and Work Load			
Activity	**Count**	**Duration**	**Work Load (Hours)**
Lectures	14	2	28
Self-Study	16	4	64
Assignments			
Presentation / Seminar Preparation			
Midterm Exam	1	2	2
Recitations	14	1	14
Laboratory			
Projects	2	25	50
Final Exam	1	2	2
		Total Work Load	**174**
		ECTS Points (Total Work Load / Hours)	**6**

Learning Outcomes	
1	The students develop a first understanding of the structural structure and properties of ideal crystals
2	Students learn structure-process-property relations

DEPARTMENT OF MATERIALS SCIENCE AND TECHOLOGY
COURSE SYLLABUS

3	Students comprehend mechanical behaviors of materials, microstructure control, phase diagrams and phase transitions
4	Students learn mechanisms of elastic and plastic deformations
5	Students become capable to understand the effect of deformation on material's microstructure
6	Students recognize mechanical testing methods of materials
7	Students have the knowledge of 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)

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

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

DEPARTMENT OF MATERIALS SCIENCE AND TECHOLOGY
COURSE SYLLABUS

7							
8							
9							
10							
11							
12							

Contribution Level	1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High
Compiled by:	
Date of Compilation:	