DEPARTMENT OF MATERIALS SCIENCE AND TECHOLOGY
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
MWT301	3			5
Title	**T**	**A**	**L**	**ECTS**
Real Crystals and Their Properties	3	2		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**	**X**	**Elective**			
Objectives	The students learn the thermodynamic and elastomechanical concepts for the description of defect structures and their interaction and know experimental methods for the determination of defect properties. It will give a first understanding of how defect structures and material properties are related and how they can be adjusted.					
Content	Point defects: thermodynamics and structure of intrinsic and extrinsic point defects, crystal plasticity: stress-strain curves, tristate curves, line defects: dislocation theory, detection of dislocations, interaction of point defects and impurities with dislocations: climbing, dislocations, solid solution hardening, surface defects: grain boundaries and surfaces, domain walls, interaction of point defects with surface defects, interaction of dislocations with grain boundaries: fine grain hardening, volume defects: formation and properties of precipitates, interaction of point, line and surface defects with precipitates, related defects and mechanical / electrical etc. with material properties					
Prerequisites						
Coordinator	None					
Lecturer(s)	Asist Prof.Dr. Çağatay Elibol					
Assistant(s)	None					
Work Placement	No					

Recommended or Required Reading	
Books / Lecture Notes	Lecture Notes
Other Sources	1.G.Gottstein: „Physikalische Grundlagen der Materialkunde“, Springer (2007). 2. D.Hull, D.J.Bacon: “Introduction to dislocations”, Elsevier (2001). 3. P.Haasen: “Physical Metallurgy”, Cambridge University (1996). 4. J.R.Weertman, J.Weertman: “Elementary dislocation theory”, Oxford Univ. Press (1992). 5. Ch.Kittel "Einführung in die Festkörperphysik" 14. Auflage, Oldenbourg Verlag München (2006). 6. Web-Skript: http://www.tf.uni-kiel.de/matwis/amat

Additional Course Material

DEPARTMENT OF MATERIALS SCIENCE AND TECHOLOGY
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Documents		
Assignments		
Exams		
Course Composition		
Mathematics und Basic Sciences		%
Engineering		80%
Engineering Design		%
Social Sciences		%
Educational Sciences		%
Natural Sciences		%
Health Sciences		%
Expert Knowledge		20%

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	3	42
Self-Study	14	3	42
Assignments	2	20	40
Presentation / Seminar Preparation			
Midterm Exam	1	3	3
Recitations	14	3	42
Laboratory			
Projects			
Final Exam	1	3	3
		Total Work Load	**172**
		ECTS Points (Total Work Load / Hours)	**6**

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Learning Outcomes	
1	The students learn the thermodynamic and elastomechanical concepts for the description of defect structures and their interaction and know experimental methods for the determination of defect properties.
2	
Weekly Content	
1	Plastic deformation of metals (mechanisms, critical shear stress, deformation of fcc single crystals and polycrystals)
2	Plastic deformation of metals (mechanisms, critical shear stress, deformation of fcc single crystals and polycrystals)
3	Crystal / lattice defects (dislocations, vacancy, interfaces)
4	Crystal / lattice defects (dislocations, vacancy, interfaces)
5	Crystal / lattice defects (dislocations, vacancy, interfaces)
6	Diffusion (phenomenological and atomistic view)
7	Diffusion (phenomenological and atomistic view)
8	Solidification of melts (homogeneous vs. heterogeneous nucleation & growth)
9	Solidification of melts (homogeneous vs. heterogeneous nucleation & growth)
10	Recovery & Recrystallization
11	Precipitation processes
12	Martensitic phase transformation
13	
14	

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

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

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