Course Title	**Material Science and Engineering I**				
Course Code	**MME 155**				
Course Type	Compulsory				
Level	Undergraduate				
Year / Semester	1st year / 2nd Semester				
Teacher's Name	Theodora Kyratsi				
ECTS	5	Lectures / week	3+1 hours	Laboratories / week	1 hour
Course Purpose and Objectives	A course in understanding the structure-property relations of metals, ceramics, polymers and composites with emphasis on mechanical properties.				
Learning Outcomes	• Define crystallinity, typical unit cells, density, Miller indices; crystal defects. • Describe the diffusion mechanism at atomic level. • Name and describe the two atomic mechanisms of steady-state and non-steady-state diffusion. • Read engineering stress-strain diagram and define elasti/plastic deformation, mechanical terms and properties (tensile strength, yield strength, Young modulus, Poisson ratio, ductility etc). • Describe strengthening mechanisms (grain size effect, solid solutions and cold-working) based on dislocations and define fatigue and creep. • Describe (qualitative) and analyze (quantitative) microstructures based on phase diagrams. • Describe heating processes of metals via isothermal transformation, annealing and precipitation. • Compare the mechanical behavior of metallic, ceramic and polymeric materials using stress-strain graphs. • Predict the mechanical properties of composite materials.				
Prerequisites	None	Required	None		
Course Content	This course is the first part of the series "Materials Science and Engineering" and includes: Crystal structure; Unit cells – density – crystallographic directions and planes; Dislocations and Defects; Material microstructure; Diffusion – Elastic and Plastic Deformation; Stress vs Strain – Definition of Mechanical Properties (tensile strength, yield strength, Young modulus, Poisson ratio, ductility etc); Strengthening of metals (grain size, solid solutions, cold work); Failure of materials; Fatigue; Creep; Phase diagrams and phase transformations; Heat treatment of metals; Annealing; Precipitation Hardening; Characteristics of common alloys (i.e. perlite, benite, martensite, temper martensite), Processing and mechanical properties of metals and ceramics; Composite materials; Fiber Composites; Prediction of mechanical properties of composites made by known materials.				

	Laboratory Exercises • Introduction to crystallography • Metallography • Phase diagrams • Impact test • Hardness test (Rockwell, Vickers)
Teaching Methodology	• Lectures • PowerPoint presentations • Laboratory exercises • Laboratory demonstrations • Communicative, Collaborative • During the first week of the semester, the course syllabus is given to students, which includes information on the course content, expected learning outcomes, assessment and office hours.
Bibliography	• Callister, W.D., *Materials Science and Engineering* (translated in Greek). Tziolas.
Assessment	• Midterm exam 35% • Final exam 50% • Laboratories 5% • Presentation 10%
Language	Greek