Course Title	**Materials Physics**				
Course Code	**MME 563**				
Course Type	**Compulsory**				
Level	Graduate				
Year / Semester	Fall Semester				
Teacher's Name	Ioannis Giapintzakis				
ECTS	8	Lectures / week	2 x 1.5 h	Laboratories / week	--
Course Purpose and Objectives	The main objective is the understanding of the structure-physical properties relationship for the whole range of materials - metals, ceramics and polymers. The course places emphasis on the understanding of phenomena and calculation of physical quantities related to electrical, thermal, magnetic and dielectric properties of solids.				
Learning Outcomes	• Describe the different types of atomic structure and chemical bonding and correlate them with the physical properties of solids • Calculate cohesive energy, equilibrium lattice constants, reciprocal lattice space and structure factor for different atomic structures of solids • Describe the physical mechanisms and calculate heat capacity, thermal expansion and thermal conductivity in insulators • Explain the differences between the Jellium model and the nearly free electron approximation and use the two models to describe/calculate physical properties such as specific heat, electrical and thermal conductivity in metals • Discuss and sketch the electronic band structure of crystalline solids • Explain the physical mechanisms of paramagnetism, diamagnetism, ferromagnetism and antiferromagnetism • Describe the fundamental phenomena and basic theory of superconductivity • Describe the absorption of electromagnetic radiation in solids				
Prerequisites	NO	Required	NO		
Course Content	Crystal lattice and symmetry; Bonds and structure; Defects; Phonons; Heat capacity in insulators; Thermal expansion; Phonon thermal conductivity; Jellium model; Fermi statistics; Specific heat in metals; Nearly free electron approximation; Density of electronic states; Electronic band structure; Effective mass; Electrical conductivity in metals; Wiedemann-Franz law; Thermoelectric phenomena;				

	Superconductivity (Fundamental phenomena); BCS theory; Dielectric properties; Paramagnetism; Diamagnetism; Ferromagnetism; Antiferromagnetism.
Teaching Methodology	Lectures; Homework exercises; Reports and Presentations by students on selected current topics of materials physics Communicative, Collaborative During the first week of the semester, the Syllabus of the course is given by the teacher, which includes information on the course content, expected learning outcomes, assessment and office hours
Bibliography	Charles Kittel, *Introduction to Solid State Physics*, 8th Edition; H. Ibach & H. Lüth, *Solid-State Physics*, 3rd Edition, Springer-Verlag, Berlin (2003)
Assessment	Homework exercises (15%); report/presentation (15%); Midterm Exam (35%); Final Exam (35%)
Language	English