INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
भारतीय प्रौद्योगिकी संस्थान तिरुपति
Yerpedu-Venkatagiri Road, Yerpedu Post, Tirupati District, Andhra Pradesh - 517 619

1.	Title of the course	Introduction to Materials Science
2.	Course number	ME215L
3.	Structure of credits (L-T-P-C)	3-0-0-3
4.	New course/modification to	Modified with ME203M/MATERIAL SCIENCE AND ENGINEERING
5.	To be offered by	Mechanical Engineering
6.	Proposed by	AJAY KUMAR
7.	Prerequisite	None
8.	**Course Objective(s):** To discuss the fundamentals of materials science, including the crystallography, principles of alloy formation, plastic deformation, mechanical properties, various types of heat treatment processes, isothermal transformation and continuous cooling transformation diagrams. To understand the concept of ceramic, composite and polymeric materials.	
9.	**Course Content:** Introduction to crystallography: atomic bonding, unit cells, crystal systems, metallic crystal structures, imperfections in solids; Principles of alloy formation: solid solution, Hume-Rothery rules, binary phase diagrams, development of microstructure under equilibrium cooling and effects of non-equilibrium cooling, iron-iron carbide phase diagram; Elastic and plastic deformation: slip systems, critical resolved shear stress, Frank-Read source, work hardening, dynamic recovery, strengthening mechanisms, recovery, recrystallization and grain growth, cold and hot working; Mechanical properties: hardness, tensile strength, ductility, resilience and toughness, impact strength, fatigue and creep; Heat treatment: types of heat treatment, isothermal transformation diagram, continuous cooling transformation diagram; Ceramics, polymers and composite materials and their applications; Shape memory materials and their applications.	
10.	**Textbook(s):** 1. Askeland D R, The Science and Engineering of Materials, 5th Edition, Thomson (2005). 2. Callister W D, Materials Science and Engineering, 2nd Edition, Wiley India (P) Ltd. (2014).	
11.	**Reference(s):** 1. Avner S H, Introduction to Physical Metallurgy, 2nd Edition, McGraw Hill Education (2017). 2. Kodgire V D, Material Science and Metallurgy for Engineers, 31st Edition, Everest Publishing House (2011). 3. Raghavan V, Materials Science and Engineering - A First Course, 6th Edition, Prentice Hall India Learning (P) Ltd (2015).	