Course Code & No	**ME 351**		رقم المقرر ورمزه
Course Name	**Fundamentals of Materials Engineering**		اسم المقرر
Credit Hours	**4 (3+1+2)**		عدد الساعات المعتمدة
Pre-requisite	**CHEM 101,PHYS 102**		المتطلب السابق

General Description	توصيف عام
Introduction and classification of materials; Structure of atoms and effect of atomic bonding on thermal and mechanical properties; Structure of metals, ceramics, and polymers; Imperfections in crystalline solids and Microscopic Examinations; Mechanical properties and testing; Mechanism of Strengthening in Metals; Equilibrium-phase diagrams; Applications and processing of metal alloys; Introduction to Nano materials; Material selection for design and manufacturing	

Course Objectives	أهداف المقرر
To gain detailed knowledge of basic material engineering and classification including the various levels of materials structures and atomic bonding and microstructure effect on the properties of materials particularly the mechanical properties; as well as material selection for design and manufacturing and the ability to use different heat treatment and phase diagrams. **By the end of the course, each student should be able to** • Familiarize the student with the fundamentals of materials of engineering significance, their classification and their diverse applications. • Develop familiarity with different level of structures (atomic, crystal, and microscopic) in engineering materials, and how atomic bonding and microstructure affect the properties of materials. • Evaluation of mechanical properties. • Understand and be able to use different heat treatment and phase diagrams, especially the Iron - Carbon phase diagram to design alloys that covers certain properties. • Select material for various engineering application	

Course Outlines	مفردات المقرر

- Introduction to materials, Materials science and engineering, Classification (metals, ceramics, polymers, composites. Advanced Materials.
- Structure of atom, bonding and coordination in metals, polymers and ceramics. Effect of atomic bonding on thermal and mechanical properties.
- Structure of metals (lattices, crystals, crystal directions, planes). Crystalline and non-crystalline solids. Indices and densities, polymorphism and allotropy. Structure of Ceramics. Structure of polymers.
- Imperfections in crystalline solids; point, linear and planar defects. Microscopic Examinations.
- Mechanical properties (elastic and plastic deformation, slip systems and deformation mechanisms). Mechanical testing (tensile, torsion, bending, impact, hardness). Mechanism of Strengthening in Metals, Annealing; recovery, recrystallization and grain growth.
- Equilibrium-phase diagrams, their construction and types, phase changes, and phase quantities. Relation between phases and properties.
- Applications and processing of metal alloys. Ferrous and nonferrous alloys, Thermal processing of metals. Standard classifications of Metals
- Polymers, Ceramics and Glasses production and properties.
- Introduction to Nano materials
- Material selection for design and manufacturing

References	المراجع
Required Textbooks Materials Science and Engineering - An Introduction, W.D. Callister, the latest edition, John Wiley. **Essential References Materials** • Introduction to Materials Science for Engineers, J. F. Shackelford, the latest edition Prentice Hall. • An introduction to their properties and applications - M. Ashby & D. Jones, Latest edition • An introduction to microstructures, processing & design - M. R. Ashby & D. R. H. Jones, Latest edition	