Semester:	02				
Course Code:	CE1110				
Course Name:	Materials Science				
Credit Value:	3 (Notional hours: 150)				
Pre-requisites:	None				
Core/Optional	Core				
Hourly Breakdown	**Lecture hrs.**	**Tutorial hrs.**	**Practical class hrs.**	**Assignments hrs.**	**Independent Learning & Assessment hrs.**
	29	7	12	6	96

Course Aim: To relate the properties of Engineering Materials to their atomic, molecular and microstructural features in order to select materials in design applications.

Intended Learning Outcomes:

On successful completion of the course, the students should be able to;

- **classify** different types of engineering materials based on atomic structure or function
- **determine** the equilibrium phases and their constitution in binary alloys using a binary phase diagram
- **describe** the structure, property and process relationship and applications of each major class of materials.
- **use** standard testing methods to obtain properties of engineering materials

Course Content: (Only main topics & subtopics)

- **Introduction to Engineering Materials:** Different classes based on material properties; Introduction to material property charts; Classification of materials based on function and atomic structure
- **Mechanical testing of materials and Introduction to laboratory testing practices:** Introduction to standards and general laboratory practices
- **Atomic bonding in Materials :** Atomic bonding of materials and its implications on mechanical and physical properties; Crystalline, semi crystalline and amorphous structures; Band structure of metals, semiconductors and insulators
- **Crystallography**: Lattice, basis, unit cells and crystal structures; Miller indices; closed packed planes and directions Defects in crystalline solids: Point, line, surface and volume defects
- **Introduction to metals and metal alloy systems:** Solid solutions and phase equilibrium
- **Introduction to strengthening methods**: Intrinsic (such as work hardening, heat treatment)and Extrinsic (solid solution strengthening, precipitation/dispersion strengthening) methods

- **Atomic diffusion in materials**: Laws of diffusion, applications of diffusion
- **Structure, properties and processing of different materials**: Ceramics and Glasses, Polymers, Hybrid and composite materials; Traditional construction materials such as wood, cement, Advances in construction materials
- **Introduction to smart materials and systems**: sensors and actuators, nanomaterials and their applications

Teaching /Learning Methods:

Lecture, demonstrations, practical, tutorial

Assessment Strategy:

Continuous Assessment 50%	Final Assessment 50%		
Details: Quizzes 10% Mid Semester Examination 25% Other Laboratory 15%	Theory (%) 50%	Practical (%)	Other (%) (specify)

Recommended Reading:

- Ashby, M. F. and Jones, D. R. H., Engineering Materials Vol. 1 and 2, 3rd Edition, Butterworth – Heinemann, 2005.
- Askeland, D. R. , Fulay, P. P., and Wright, W. J., The Science and Engineering of Materials, 6th Edition, Cengage Learning, 2010
- Ashby, M. F., Materials Selection in Mechanical Design, 3rd Edition, Butterworth – Heinemann, 2005.
- Ashby, M. F., Shercliff, H. and Cebon, D., Materials Engineering, Science, Processing and Design, 1st Edition, Butterworth – Heinemann, 2007