

Materials Science

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| Course code: | 28861 |
| Credits: | 3 |
| Course Type: | Theoretical |
| Prerequisites: | General Chemistry |
| Course Length: | 51 hours |

Outline:

1. Introduction
Types of Materials, Properties of Materials, Materials in Engineering Design and Manufacturing
2. Atomic Structure and Bonding.
3. Crystal structures and crystal Geometry.
Unit cells crystal systems, atom positions, direction, planes, volume, planar and linear density, polymorphism, crystal structure analysis (using x-ray)
4. Solidification, Crystalline imperfections, Diffusion in Solids.
5. Mechanical Properties of Metals.
Processing of Metals and Alloys, stress-strain Diagram, Hardness, Plastic deformation of Metals, solid-solution, Recovery and Recrystallization, Fracture of Metals, Metal Fatigue, Creep and stress Rupture of Metals.
6. Phase Diagrams
7. Engineering Alloys.
Production of Iron and steel, Iron-Iron carbide phase diagram, Heat treatment of steels, Phase transformations, Low-alloy steels, Aluminum alloys, Stainless steels, Cast Irons.
8. Introduction to polymeric Materials.
9. Introduction to Ceramic Materials.
10. Materials Selection for Engineering Design.

Reference:

Foundations of Materials Science and Engineering, W.F. Smith, J. Hashemi,
Fifth Edition, McGraw Hill, 2010.