

Introduction to Materials Science and Engineering - Web course

COURSE OUTLINE

Historical perspective, scope of materials science and engineering.

Atomic structure and interatomic bonding.

Lattices, basic idea of symmetry.

Bravais lattices, unit cells, crystal structures, crystal planes and directions, co-ordination number.

Single crystals, polycrystalline, non-crystalline, nano crystalline materials.

Imperfections in solids: point defects, line defects, surface defects.

Solid solutions, phases, phase diagrams. Diffusion phenomenon, phase transformations. Strengthening mechanisms.

Classification of materials, properties of materials.

Structure, properties and applications of different metals and alloys, ceramics and polymers.

COURSE DETAIL

S.No	Lecture Titles	Hours
1	Historical perspective	3 hrs
2	Scope of Materials Science and engineering	1 hr
3	Atomic structure and interatomic bonding	4 hrs
4	Lattices, basic idea of symmetry	3 hrs
5	Bravais lattices, unit cells, crystal structures, crystal planes and directions, co-ordination number.	5 hrs
6	Single crystals, polycrystalline, non-crystalline, nano crystalline materials	3 hrs



NP-TEL

NPTEL

<http://nptel.iitm.ac.in>

Metallurgy and Material Science

Pre-requisites:

1. Physics, Chemistry, Maths, Elementary knowledge of Materials engineering.

Additional Reading:

1. Mechanical Metallurgy, George E Dieter. Mcgraw Hill, London.

Hyperlinks:

1. <http://neon.mems.cmu.edu/cramb/Processing/history.html>
2. http://users.encs.concordia.ca/~woodadam/MECH221/Course_Notes/Crystal%20directions%20and%20planes.pdf
3. <http://www.tulane.edu/~sanelson/eens211/introsymmetry.htm>

Coordinators:

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7	Imperfections in solids: point defects, line defects, surface defects	4 hrs
8	Solid solutions	2 hrs
9	Phases, phase diagrams	4 hrs
10	Diffusion phenomenon	2 hrs
11	Phase transformations	3 hrs
12	Strengthening mechanisms	2 hrs
13	Classification of materials, properties of materials	2 hrs
14	Structure, properties and applications of different metals and alloys, ceramics and polymers	2 hrs
Total		40 hrs

References:

1. Materials Science and Engineering, an Introduction, William D. Callister. John Willey and Sons Inc. Singapore.
2. Physical Metallurgy: Principle and Practice, V. Raghavan. Prentice Hall India Pvt Ltd.