MSE 201 Introduction to Materials Science and Engineering

Learning Objectives:

This course develops an introductory understanding of the atomic structure, crystalline structure and microstructure of solids. The student will learn the terminology and fundamental principles of materials structure and their related properties. The course introduces the student to mechanical, physical, and chemical properties which are of engineering significance. The course directly supports overall MSE program education outcomes 1, 2, 3, 4 and 7. The laboratory associated with this course contributes to improved team work and communication skills of the student, program outcomes 4 and 5.

Catalog Description:

201 Introduction to Materials Science and Engineering (3)
Correlation of atomic structure, crystal structure and microstructure of solids with mechanical, physical and chemical properties of engineering significance. Prereq: Chemistry 120.

Textbook: William D. Callister, Materials Science and Engineering, An Introduction, John Wiley & Sons, Inc., 6th edition, 2003.

References: William F. Smith, Principals of Materials Science and Engineering, McGraw - Hill Publishing Company, 1990.

L. H. VanVlack, 4th Edition, Elements of Materials Science and Engineering, Addison-Wesley, 6th edition, 1989.

Topics:

1. Chemical bonding.
2. Structure of crystalline solids.
3. Imperfections in solids.
4. Diffusion.
5. Mechanical properties of metals.
6. Dislocations and strengthening mechanisms.
7. Failure of materials.
8. Phase diagrams.
9. Phase transformations in metals.
10. Thermal processing of alloys.
11. Structure and properties of ceramics.
12. Applications and processing of ceramics.
13. Polymer structures.
14. Applications and processing of polymers.
15. Composites.

Laboratory Projects:

1. Rubber Elasticity
2. Steels (Tensile and Impact)
3. Cold Rolling & Annealing
4. Cold Rolling & Annealing
5. Heat treatment of Steel
6. Mechanical Behavior of Polymers (Tensile and Impact)

Estimated Content: 3 Credits Engineering Topics

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