EGR 235-Engineering Materials

Course Syllabus; Sp 2021

Course Instructor- Dr. Akm Rahman

Course Outline:

This course gives you an introduction to atomic and molecular structure of materials and its effect on the physical and Mechanical properties of materials in engineering applications. In this course you will learn about the Properties and applications of materials including ferrous and non-ferrous metals, alloys, polymers, ceramics, electronics, composites, adhesives and lubricants. You will also be introduced to strengthening mechanism of metals including dislocations, alloying, Heat treatment, cold and hot working and their perspectives on phase diagrams and microstructure. Several Laboratory experiments are conducted to demonstrate hardness, plastic deformation, annealing, nondestructive testing, metallographic analysis and computer aided problem solving.

Book (Suggested)- Materials Science and Engineering, 8 Th Edition and up.

By- William D Callister

Atomic Structure and Interatomic Bonding

Electrons in Atoms

The Periodic Table

Atomic bonding in solids

Bonding Forces and Energies

Primary Interatomic Bonds

Secondary Bonding or van der Waals Bonding

Materials of Importance—Water (Its Volume Expansion Upon Freezing)

Molecules

The Structure of Crystalline Solids

Unit Cells

Metallic Crystal Structures; Density Computations; Polymorphism and Allotropy; Crystal Systems

Crystallographic Points, Directions, And Planes

Point Coordinates; Crystallographic Directions

Crystallographic Planes

Linear and Planar density

Crystalline and Non-Crystalline Materials

X-Ray Diffraction: Determination of crystal structures

Imperfections in Solids

Point defects

Vacancies and Self-Interstitials; Impurities in Solids

Specification of Composition

Miscellaneous imperfections

Dislocations–Linear Defects; Interfacial Defects

Materials of Importance—Catalysts (and Surface Defects)

Bulk and Volume Defects

Atomic Vibrations

Microscopic Examination

Grain Size Determination

Mechanical Properties of Metals

Elastic Deformation and Plastic Deformation

Dislocations and Strengthening Mechanisms

Recovery, Recrystallization and Grain Growth

Measurement of Mechanical properties

Properties of Non-Metallic Materials

Physical properties of composites

Mechanical Properties of Composites

Grading Policy

HW- 30%

Test 1-

Test 2-

Test 3-

Best 2 test- 40%

Project- 20%

Quiz- 10%