Mechanical Engineering Dept. Department

Syllabus
ME 471: Mechanical Metallurgy (3-0-3)

Course Catalog Description:

Review of mechanical properties of metals and alloys. Introduction to theory of elasticity. Elements of theory of plasticity; flow curve, yield criteria, plastic stress-strain relationship, introduction to slip-line fields. Metallurgical aspects of plastic deformation. Metalworking processes: Forging, rolling, extrusion, and drawing.

Course Pre-requisites:

- ME 216: Materials Science and Engg.
- ME 217: Materials Lab

Course Objectives:

1. To develop students ability to correlate deformation mechanism and failure in metals and alloys.
2. To develop students understanding on dislocation theory and their relationship to the strengthening mechanism of metals and alloys.
3. To integrate students' knowledge on the microstructural factors affecting the structural properties of metal and alloys.
4. To develop students knowledge on effective design of metal and alloys thermomechanical processing (metal work) for safe durable application.

Course Learning Outcomes:

CLO1. Be able to gain knowledge of ductile and brittle metal, their elastic and plastic deformation, and failure.

CLO2. Be able to gain knowledge of dislocation theory and its role strengthening mechanism of metal to conduct proper and simple analysis of strength of metals and alloys.

CLO3. Be able to analyze data and interpret results of metals and alloys laboratory experiments to relate strength and plasticity needed for structural application.

CLO4. Be able to understand the factors affecting thermomechanical metal works of metal and alloys and design necessary procedure for economically fabricate metal and alloys.

CLO5. Be able to analyze, understand the contemporary issues and emerging technologies related to the fabrication of structural metals and alloys.

Learning Resources:

- Mechanical Metallurgy, SI metric edition, 1988, George E. Dieter, McGraw-Hill Book, UK.

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Homework	None	15.0%
Quiz	None	15.0%
Midterm	None	25.0%
Project	None	10.0%
Final	None	35.0%

Lecture Weekly Schedule:

Week#	Topics
1	Mechanical fundamental.
2	Stress and strain relationships for elastic behavior.
3	Stress and strain relationships for elastic behavior. (Continue)
4	Elements of the theory of plasticity.
5	Elements of the theory of plasticity. (Continue)
6	Plastic deformation of single crystals.
7	Plastic deformation of single crystals. (Continue)
8	Dislocation theory.
9	Strengthening mechanisms and fracture.
10	Strengthening mechanisms and fracture. (Continue)
11	Applications to materials testing.
12	Fundamentals of metal working.
13	Forging, rolling and extrusion.
14	Forging, rolling and extrusion. (Continue)
15	Sheet metal forming.