

FACULTY OF **ENGINEERING**

DEGREE COURSE: **INDUSTRIAL ENGINEERING**

MASTER DEGREE: **INDUSTRIAL ENGINEERING / DESIGN**

**SUBJECT:** MECHANICAL METALLURGY

**LECTURER:** MOHAMAD EL MEHTEDI

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### **OBJECTIVES**

At the end of the course the student will know how the main physical and metallurgical characteristics (crystal structure, defects, microstructure) affect the mechanical properties of a metallic material;

### **CONTENTS**

Crystals structures (fcc, bcc and hcp); indexing planes and directions; defects in metals, liquid-solid transformations, solidification in non-equilibrium conditions, steel transformations. Vacancies, dislocations and grain boundaries. Dislocation interaction, bowing of dislocations, dislocation sources. Stress and strain in mono- and polycrystals. Strengthening mechanisms (cold working, solid solution, grain refining, precipitation hardening). Fatigue and fracture. Atomic diffusion in metals; recovery and recrystallization; high temperature deformation, creep, superplasticity. An overview of materials selection in mechanical design.

### **LEARNING OUTCOMES**

The student will be able to understand the causes of some structural and technological behaviours already focused in other courses commonly dealing with Engineering practice and mechanical design.

## **ASSESSMENT**

Written exam: multiple choice and open questions

## **RECOMMENDED TEXTBOOKS**

The student should know some fundamentals of Chemistry (atomic bonds) and the nature of mechanical properties.

Textbook:

- George E. Dieter Jr., Mechanical Metallurgy, Editor:  
McGraw-Hill.