**The Hashimate University-College of Engineering**

**Department of Industrial Engineering**

**Properties of materials-Fall 2012/1013**

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**Instructor:** Dr. M. Ajarrah

**Office Hours:** Sunday 9:00-10:00 am, Monday 2:00-3:30 pm and Thursday 3:30-5:00 pm

**Text Books:**

1. *Material Science and Engineering-An Introduction*, William D. Callister, Jr., Wiley 5th, 6th and 7th.
2. *Physical Metallurgy principles,* R. Abbaschian, L. Abbaschian and R.E. Reed-Hill*.* Cengage Learning,4th

**OBJECTIVES**

The objective of this course is to provide you with a basic understanding into the structure, behaviour and properties of the typical, common engineering materials - metals, ceramics, polymers and composites and the methods of observing, measuring and interpreting these properties.

**REASONING**

The reason why knowledge of materials is useful to you is that all engineers make use of materials in one form or other whether they are designing gas turbine engines, DVD players, roller blades or an artificial hip joint and the ability to make the correct selection of material for a particular application or to understand the response of a material to an applied condition, is of paramount importance. Choosing a suitable material for an application is a demanding task as mistakes can be costly in many ways, and an understanding of the structure and behaviour of materials are essential to go beyond the "well, this is what they used last time" approach.

**LECTURES**

You are strongly advised to attend all lectures and to go through the upcoming material before coming to class.

**SYLLABUS**

* Introduction to Materials Science (Chp. 1)
* Atomic Structure & Interatomic Bonding (Chp. 2)
* The Structure of Crystalline Solids (Chp. 3)
* Imperfections in Crystals (Chp. 4)
* Diffusion (Chp. 5)
* Mechanical Properties of Metals (Chp. 6.1 – end of 6.6, 6.10)
* Dislocations & Strengthening Mechanisms (Chp. 7.1 – end of 7.4)
* Phase Diagrams (Chp. 9.1 – end of 9.15, 9.18 – end of 9.19)
* Structures, Properties, Applications and Processing of Ceramics (Chps. 12 and 13)
* Polymer Structures (Chp. 14)
* Applications & Processing of Polymers (Chp. 15.1, 15.2, 15.7- end of the chapter)
* Electrical, Thermal, and Optical Properties (Chps. 18.1-18.15, 19-all, 21-all)

**Evaluation:**

First Exam 25 %

Second Exam 25 %

Final Exam 50 %