Philadelphia University

Faculty of Engineering - Department of Mechanical Engineering
First Semester 2017/2018

Course Information

Title: Properties of Engineering Materials (620373)

Prerequisite: Strength of Materials (620213)

Credit Hours: 3 credit hours (16 weeks per semester, approximately 44 contact hours)

Textbook: Materials science and engineering -7th edition by William D. Callister Jr.

References:
- Materials science and metallurgy, 3rd edition, Herman W. Pollack.
- Material science and metallurgy, 1st.edition, O. P. Khanna

Description: The course is a requirement for Mechanical engineering students. It is an introduction to the means and methodologies used by engineers in Materials. Student will be introduced to the main properties of various engineering materials, their use and selection.

Instructor: **Dr.Hasan Al Dabbas**
Office: Mechanical Engineering building, room E61209 , ext. : 2134
Office hours: Sun., Tues., Thurs.: 10:00-11:00

Course Topics:

Week	Topic
1,2	Introduction Classification of materials, The Structure of Crystalline Solids
3	Imperfections in Solid Diffusion, failre
4,5	Mechanical properties of materials. Elasticity Plasticity, Tensile, Hardness and Material testing
First Examination 6	Physical and Thermal properties of materials: • Specific heat • Thermal expansion • Melting point • Thermal elastic and electrical effect • Thermal and electrical conductivity • Ferromagnetism and para magnetism
7,8,9	Phase Diagram Iron-carbon alloys • Iron and carbon properties • The iron-carbon equilibrium diagram • Transformation on heating and cooling in the 0-6.6 % carbon • Carbon steels • Effect of small quantities of (C, Si, Mn, P, S, O2 ,H2 , N2) on the steel properties • Cast irons Different types of cast iron • Effect of small quantities of (Si, Mn, P, S, C) on the cast irons

Second Examination 10,11,12	• Heat treatment of steels • Austenite transformation as constant temperature • Austenite transformation on continuous cooling • Grain size • Effect of austenite grain size on properties, Annealing, Normalizing, Austempering Tempering hardening and Hardenability • Surface hardening and surface modification
13,14	• Alloy steels • Function of alloying elements in steel • Classification of alloy steels • Structural steel corrosion and scale resistance alloy steels • Tool steels • Spring steel • High strength Heat resistance alloys
15	Non- ferrous metals and their alloys Introduction to Copper Aluminum Nickel
Final Examination 16	Tutorial and problem solving

Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should be able to:

1.	Understand the basic concepts of Fundamental of mechanical behavior of material ..	[a, e, k]
2.	Understand the Structure and manufacturing properties of metal-Phase diagrams and heat treatment	[a, e, k]
3.	Apply the above mentioned three basic concepts and to understand their respective advantages.	[a , e, k]
4.	Understand the Casting processes, Bulk deformation processes: forging, drawing, rolling, and extrusion. Sheet metal forming processes:	[a , e, k]
5.	Effectively communicate in writing an assignment.	[g]

Assessment Instruments:

Evaluation of students' performance (final grade) will be based on the following categories:

Exams: Two written exams will be given. Each will cover about 3-weeks of lectures

Quizzes: 10-minute quizzes will be given to the students during the semester. These quizzes will cover material discussed during the previous lecture(s).

Homework: Problem sets will be given to students. Homework should be solved individually and submitted before the due date.

reports technical reports will be prepared during semester and it will cover any subject of material

Final Exam: The final exam will cover all the class material.

Grading policy:

First Exam	20%
Second Exam	20%
Home works, Quizzes and reports	20%
Final Exam	40%
Total:	100%

Attendance policy:

Absence from classes and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse, acceptable to and approved by the Dean of the relevant college/faculty, shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

October , 2017