



Engineering Program

Specialization	Engineering Program Requirements
Course Number	20201121
Course Title	Engineering Materials
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Brief Course Description:

Definition of engineering materials. Classification of materials and their properties. Metallic and non-metallic materials. Metals, alloys and composite materials. Conductors, insulators and semiconductors. Mechanical, magnetic, thermal and electrical characteristics of materials. Industrial applications of different types of materials.

Course Objectives:

The course is designed to introduce students in engineering program specializations to the basic concepts of engineering materials and their applications.



Detailed Course Outline:

Unit Number	Unit Title	Unit Content	Time Needed
1.	Introduction to engineering materials	<ul style="list-style-type: none"> ▪ Importance ▪ Classification of engineering materials: metals, ceramics, polymers, alloys and composites 	
2.	The structure of materials	<ul style="list-style-type: none"> ▪ General overview ▪ Metal atoms ▪ Crystals and grains ▪ The unit cell ▪ Correlation of data on unit cells with measurements of density, atomic radius, planer density, and linear density ▪ Close packed hexanol metals 	
3.	Solid solutions and phase equilibrium	<ul style="list-style-type: none"> ▪ Types of solid solutions ▪ Properties of solid solutions ▪ Eutectiferous alloys ▪ Equilibrium diagrams ▪ Effect of alloying upon behavior during solidification ▪ Complete solubility in solid state ▪ Non solubility in solid state ▪ Limited solubility in solid state 	
4.	Mechanical properties and microstructure control	<ul style="list-style-type: none"> ▪ Strength, hardness, elasticity, plasticity, ductility, toughness, brittleness ▪ Engineering stress-strain relations ▪ Effect of mechanical properties on metal structure ▪ Creep and fatigue 	
5.	Electrical properties of materials	<ul style="list-style-type: none"> ▪ Electrical conductivity ▪ Conduction and carriers ▪ Conductors, semiconductors, insulators ▪ Applications 	
6.	Magnetic properties of materials	<ul style="list-style-type: none"> ▪ Magnetic circuit and magnetic permeability 	

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		<ul style="list-style-type: none">▪ Magnetic domains▪ Magnetic saturation▪ Effect of temperature on magnetization	
7.	Control of mechanical properties by manipulation and by heat treatment	<ul style="list-style-type: none">▪ Control of grains▪ Cold working and hot working▪ Strengthening mechanism▪ Heat treatment and alloys	

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Quizzes		10%	

Teaching Methodology:

- ❖ Lectures and presentations

Text Book

1. Engineering Materials and their applications, Richard A. Flinn and Paul K. Torjon, Houghton Mifflin Company.



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