COURSE PLAN

FIRST: BASIC INFORMATION

College

College	: Faculty of Karak - Balqa Applied University
Department	: Mechanical Engineering

Course

Course Title	: Material Science
Course Code	: 020209131
Credit Hours	: 2 (2 Theoretical, 0 Practical)
Prerequisite	:

Instructor

Name	: Eng.Qutaibah tarawneh
Office No.	:
Tel (Ext)	:
E-mail	: Q.tarawneh@bau.edu.jo
Office Hours	:

Class Times

The building	today	Start time	End time	Hall number

Text Book

Title : James F. Shackelford , Introduction to Materials Science for Engineers 7th Edition, Pearson Int. Edition, 2009.

References

1. James F. Shackelford , Introduction to Materials Science for Engineers 7th Edition, Pearson Int. Edition, 2009.

SECOND: PROFESSIONAL INFORMATION

COURSE DESCRIPTION

This course deals with classification of engineering materials, atomic bonding, crystal structure and crystal defects, diffusion in solid and solid solutions, effect of stresses and heat on the microstructure, physical and mechanical properties, equilibrium phase diagrams in binary alloys, Fe-carbon phase diagram, principles of heat treatment.

COURSE OBJECTIVES

The main objectives of this course are to enable the student to do the follows;

- Explain the engineering materials classification and their bonding phenomenon in a microscopic point of view.
- Explain crystalline structure of metals and crystal defects including point defects, linear defects and planar defects.

- Explain mechanical behavior of engineering materials such as stress, strain, hardness and elastic modulus.
- Explain basic phase diagram of unary and binary system, mechanical properties of metals according to heat treatment conditions.

COURSE LEARNING OUTCOMES

On successful completion of this course, students are expected to be able to:

CLO1. Explain the different classes of materials, engineering materials properties and their applications
CLO2. Explain the atomic structure, atomic bonding classification and their characteristics
CLO3. Explain the crystalline structure and crystal defects
CLO4. Explain the types and examples of diffusion
CLO5. Explain mechanical behavior of engineering metals including stress, strain, elastic deformation and hardness, etc.
CLO6. Analyze the failure mechanism of engineering materials and how to prevent it
CLO7. Interpret and draw basic kinds of phase diagram of unary and binary systems, Fe-C equilibrium phase diagram, microstructural development during cooling
CLO8. Identify the various kinds of steels and their heat treatments, the change of mechanical properties of metals according to heat treatments

COURSE SYLLABUS

Week	Units	Contents	Related L.O. and Reference (chapter)	Proposed assignments
1	Introduction to Engineering Materials	• The material world • Processing and selecting materials	CLO1	
2	Atomic Bonding	• Atomic structure • The ionic bond • The covalent bond	CLO2	
3	Atomic Bonding	• The metallic bond • The secondary, or van der Walls, Bond • Materials the bonding classification	CLO2	
4	Crystalline structure-perfection	• Seven Systems and Fourteen Lattice • Metal Structures • Lattice Positions, Directions, and Planes	CLO3	
5	Crystal Defects and Noncrystalline Structure	• The Solid Solution- Chemical Imperfection • Point Defects • Linear Defects • Planar defects • Noncrystalline solids	CLO3	
6	Diffusion	• Principles of diffusion	CLO4	
7	Mechanical Behavior	• Stress Versus Strain • Elastic Deformation	CLO5	

Week	Units	Contents	Related L.O. and Reference (chapter)	Proposed assignments
8	**Midterm Exam**			
9	Mechanical Behavior	• Plastic deformation • Hardness	CLO5	
10	Failure Analysis and Prevention	• Fracture to toughness • Fatigue	CLO6	
11	Phase diagrams	• The phase rule	CLO7	
12	Phase diagrams	• The phase diagram • Solid solution	CLO7	
13	Phase diagrams	• The lever rule • Microstructural development during slow cooling	CLO7	
14	Heat treatment	• Time-The Third Dimension • The TTT diagram	CLO8	
15	Heat treatment	• Precipitation hardening • Annealing	CLO8	
16	**Final Exam**			

COURSE LEARNING RESOURCES

Teaching will be achieved using available resources including lectures, data show, and materials uploaded on the e-learning system.

ONLINE RESOURCES

1) https://www.vitalsource.com/

ASSESSMANT TOOLS

Assessment Tools	%
Projects and Quizzes	20%
MID Exam	30%
Final Exam	50%
Total Marks	100%

THIRD: COURSE RULES

ATTENDANCE RULES

Attendance and participation are extremely important, and the usual University rules will apply. Attendance will be recorded for each class. Absence of 10% will result in a first written warning.

Absence of 15% of the course will result in a second warning. Absence of 20% or more will result in forfeiting the course and the student will not be permitted to attend the final examination. Should a student encounter any special circumstances (i.e. medical or personal), he/she is encouraged to discuss this with the instructor and written proof will be required to delete any absences from his/her attendance records.

GRADING SYSTEM

Example:

Course Marks Average		
Average	**Maximum**	**Minimum**
Excellent	100%	90%
Very Good	89%	80%
Good	79%	70%
Satisfactory	69%	60%
Weak	59%	50%
Failed	49%	35%

REMARKS

{The instructor can add any comments and directives such as the attendance policy and topics related to ethics}

COURSE COORDINATOR

Course Coordinator	**Department Head:**
Signature:	**Signature:**
Date:	**Date:**