

COURSE SYLLABUS

Intro to Materials Engineering

1001101

COURSE DETAILS

Campus: Beer Sheva	Academic year: 2023
Department: Chemical Engineering	Type of Course: Required
Discipline: Process industry	Level of Course: Undergraduate
Year of Study: Second	Semester: B
Prerequisites: Organic chemistry 1 3000211 or Organic chemistry 1 3000411	Credit: 2.5
Co-Requisites: Organic chemistry 2 3000361 or Organic chemistry 2 3000461	ECTS Credit Points: 3.75
Language of Instruction: English	Mode of delivery: Face to Face.
Work Placement(s):	
Lecturer(s): Itamar Benisti itamabe2@ac.sce.ac.il	Teaching Assistant(s): Itamar Benisti itamabe2@ac.sce.ac.il

AIM

The main objective of this course is to develop an understanding of the connection between the structures of solids and their physical and mechanical properties.

LEARNING OUTCOMES

On successful completion of the course, the students will be able to:

1. Explain the influence of structure & atomic bonds on the physical & mechanical properties of materials.
2. Identify types of basic crystal structures & better identify them using their structural motifs.
3. Explain the principles of the structural characteristics of volume & surfaces, & know different methods for researching & characterizing solids & solid structures.
4. Describe different types of defects in crystalline structures (point, lattice & planar defects) & to understand the connection between crystal lattice defects & the mechanical properties of the solid.
5. Describe how a stress curve deviates the parameters resulting from that curve, such as the elastic modulus, stress & strain deformation, stress & maximal plastic deformation, elastic & plastic behavior
6. Describe the basic principles for strengthening materials by alloying.
7. Work with phase diagrams (primarily binary) & differentiate between types of transitions & reactions (Gibbs' Law) & calculate the number of phases (Law of Leverage).

COURSE CONTENTS

Week	Subject	Relevant Reading
1	An Introduction to Crystal Structures: Lattices and Unit Cells	[1] Chapter 1
2	An Introduction to Crystal Structures: Lattices and Unit Cells	[1] Chapter 1
3	Solids and their electron structures	[1] Chapter 4
4	Physical methods for characterizing solids	[1] Chapter 2
5	The X-ray Diffraction	[1] Chapter 2
6	The X-ray Diffraction	[1] Chapter 2
7	Defects in solids and the lack of stoichiometry	[1] Chapter 5
8	Phase diagrams of solids	[2] Chapter 9
9	Mechanical properties of solids	[2] Chapter 6
10	Failure and mechanical fatigue in solids	[2] Chapter 23
11	Introduction to semiconductors	[2] Chapter 18
12	Semiconductors	[2] Chapter 18
13	Doped Semiconductors p-n Junction and Field-Effect, Transistors.	[2] Chapter 18

RECOMMENDED OR REQUIRED READING

Text book:

1. Moore, Elaine A., Smart, Lesley E., Solid State Chemistry: An Introduction, 4th ed., 2012.
2. Askeland, Donald R., The Science and Engineering of Materials, 3rd ed., 1996.

PLANNED LEARNING ACTIVITIES AND TEACHING METHODS

Lecture hours: 2, Practice hours: 1.

All the lecture and practice sessions in this course will be delivered frontally.
This course will be provided in the English language.

ASSESSMENT METHODS AND CRITERIA

Criterion	Percentage	Comments
Final Exam:	90%	
Assignments:	10%	All the homework must be submitted.