**The University of Jordan**
**School of Engineering**
**Industrial Engineering Department**
**Spring semester 2024/2025**

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| **Course name:** | **Properties of Engineering Material** | | | |
| **Course code:** | 0906273 | | | |
| **Credits hours** | 3 Hours | | | |
| **Contact hours/room:** | 8:30 –10:0 Mon, Wed. | | | |
| **Course instructor's name, E-mail, and phone:** | **Prof. Sa'ed A. Musmar**<br>s.musmar@ju.edu.jo | | | |
| **Course Coordinator:** | | | | |
| **Text book:** | • William D Callister, Materials Science and Engineering, 9th Edition, Wiley publishers. (Text Book) | | | |
| **Other reference(s):** | • Askeland D.; The Science and Engineering of Materials; Thomson Engineering Publishers. | | | |
| **Course Description:** | Introduction, Bonding forces and energies. Classification of engineering materials. Crystallography. X-ray diffraction. Imperfection in solids and strengthening mechanisms. Diffusion. Metallography. Mechanical properties of materials. Material testing evaluation and failure. Thermal equilibrium diagram. Corrosion of metals and their protection. Case studies in material selection. Relative cost of materials. | | | |
| **Providing Department:** | Industrial Engineering | | | |
| **Prerequisite Course:** | Chem. 101 / 0303101 | | | |
| **Course type** | | | | |
| **Assessment Methods:** | **Method** | | **Weight %** | **Date** |
| | Course activities | | **30** | |
| | Mid Exam | | **30** | |
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| | Final Exam | | **40** | |
| **Course Learning Outcomes**: | # | **After successful completion of this course, the student will be able to** | **SO** | |
| | **CLO1** | Be able to discuss/explain the importance of materials structure at different levels of structure. | **1** | |
| | **CLO2** | Understand the concepts of crystalline structure and its relations to physical and mechanical properties | **1** | |
| | **CLO3** | Understand the nature and importance of different types of lattice imperfections. Have a detailed idea about mechanical behavior of metallic materials. | **1** | |

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| | **CLO4** | To be able to understand and appreciate the difference between the different types of Binary Phase Diagrams and appreciate the diffusion phenomena and its application to solid materials. | **1** | |
| | **CLO5** | Understand the difference and applications of the different heat treatment processes applied to steels. General consideration on material selections. Selection of material processing method. Selection criteria | **2** | |
| | **CLO6** | To be able to work within group as a team and submit a project that will enhance their knowledge in, at least one of the subjects of course, and improvement their soft skills | **3** | |

| | **Week #** | **Topic** |
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| **Brief list of topics** | 1 | Chapter One: **Introduction** |
| | 1 | Chapter Two: ***Atomic Structure and Interatomic Bonding*** |
| | 2-3 | Chapter Three: ***The Structure of Crystalline Solids*** |
| | 4 | Chapter Four: ***Imperfections in Solids*** |
| | 5 | Chapter Five: ***Diffusion*** |
| | 6 | ***Revision + 1st Exam*** |
| | 6-7 | Chapter six: ***Mechanical Properties of Metals*** |
| | 8 | Chapter seven: ***Dislocations and Strengthening Mechanisms*** |
| | 9-10 | Chapter eight: ***Failure*** |
| | 11-13 | Chapter nine: ***Phase Diagrams*** & Hear Treatment |
| | 14-15 | *Metal Alloys, and Their Characteristics, Material Selection and Design& cost Considerations. Corrosion in metals and methods of protection*. |
| | 16 | ***Revision*** |

**Important Notes:**

- Do not hesitate to ask questions
- You are required to bring a notebook and take notes in classes.
- Students are expected to attend every class session and they are responsible for all material, announcements, schedule changes, etc., discussed in class.
- Discuss the assignments among yourselves
- Don't Cheat; direct copying of others work will NOT be allowed or tolerated and will result in a reduction of grade. If you are found to be cheating in any way, on an exam or assignment, even signing the roll sheet for another student, you will be given an "F" for the course. There will be no exceptions.
- All cases of academic dishonesty will be handled in accordance with university policies and regulations. JU policy requires the faculty member to assign ZERO grade (F) if a student misses 15% of the classes that are not excused, and 20% of the classes that are excused
- Students are expected to be ready to take a quiz any time they have a class. There will be no make-up quizzes or home works.

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| | • Any students with disabilities who need accommodations in this course are encouraged to speak with the instructor as soon as possible to make appropriate arrangements for these accommodations. |

| ***The B.Sc. in industrial Engineering program enables students to achieve, by the time of graduation the following program learning outcome (SOs).*** **Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.** | | | |
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| **1** | An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics | *5* | An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives |
| **2** | An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors | *6* | An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions |
| **3** | An ability to communicate effectively with a range of audiences | *7* | An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. |
| **4** | An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts | | |