2021-2022	Mechanical Engineering	Year 3 - Sem. 5
MECA306	**Science of Materials**	Mandatory
ECTS: 4	*Coordinator:* Pr. Marwan Azzi	*Language:* English/French
Total hours: 54 **h**	*Lectures:* Dr. Louay Al Soufi, Pr. Marwan Azzi, Dr. Ali Harkous	

Description:

Introduction to engineering materials, atomic bonds and crystalline structures, microstructure of metallic materials, equilibrium phase diagrams, diffusion, mechanical properties of materials, fracture mechanisms of materials, heat treatment of metals, metals and polymers, ceramics and composite materials.

Learning outcomes:

- Understand the microstructure of materials (crystalline structure, Defects, grain size)
- Analyze phase diagrams and determine the microstructure of alloys
- Explain the relationship between the mechanical properties and the microstructure of materials
- Propose heat treatment process to obtain desired mechanical properties
- Select appropriate material for a given application
- Identify the corrosion form and select appropriate protection method

Content:

- Atomic Bonding and Crystalline structures (Ionic, Covalent, Metallic & Secondary bondings, crystalline structures of metals and ceramics, x-ray diffraction)
- Microstructure of Materials (Point, Linear & Interfacial defects, Microstructure)
- Phase diagrams (Isomorphous, Eutectic & Peritectic Phase Diagrams, Fe-C diagrams)
- Mechanical Properties of Materials (Yield Strength, Tensile strength, Ductility, Hardness)
- Failure of Materials (fatigue, Creep, Crack propagation)
- Heat treatment of Metals (Annealing, Quenching, Tempering)
- Metals (Ferrous alloys, Non-Ferrous Alloys)
- Ceramics (Structure & Properties)
- Polymers & Composites
- Corrosion of Materials (Corrosion Potential, Corrosion rate, Forms of Corrosion, Protection Methods)

References:

- W. Callister, Materials Science and Engineering, An Introduction, 8th edition, John Wiley & Sons Inc.
- J. Shackelford, Introduction to Materials Science for Engineers. 8th edition, Pearson.

Evaluation Method:

Assessment in the following areas will be converted to points, to compute your final grade in this course:

- Mid-Term
- Final Exam
- Attendance and Participation

Description :

Introduction aux matériaux en génie, liaisons atomiques et structures cristallines, microstructure des matériaux métalliques, diagrammes de phases à l'équilibre, diffusion, propriétés mécaniques des matériaux, mécanismes de rupture des matériaux, traitement thermique des métaux, métaux et polymères, céramiques et matériaux composites.