

# BIOMATERIALS

Spring Semester 2025 - 2026

## 1<sup>st</sup> Assignment

Submission Date: <b>Wednesday, April 22, 2026</b>
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### 1. Requirements and Performance of Biomaterials

Describe in detail:

- The fundamental requirements that a biomaterial must satisfy for implantation.
- The main factors affecting the performance of an implant.
- Possible failure mechanisms and how they influence the overall reliability of the implant.

### 2. Structure and Properties of Materials.

Explain:

- The relationship between the structure (atomic and microstructure) and the properties of a material.
- The main types of bonding (ionic, covalent, metallic) and how they influence material properties.
- How crystal structure affects the mechanical behavior of materials.

### 3. We aim to design an orthopedic implant (e.g., tibial or femoral component).

Analyze:

- Which type of material you would select (e.g., metals, ceramic, polymer) and justify your choice.
- The advantages and disadvantages of this material type.
- The role of corrosion in the body and its potential effects.
- Possible methods to minimize or prevent corrosion.