



الجامعة المستقبالية



Al-Mustaqbal University

Collage of Engineering

Prosthetics and Orthotics Engineering

Second Stage

PRINCIPLES OF PROSTHETICS AND ORTHOTICS

Asst. Lec. Muntadher Saleh Mahdi

1st term – Lecture 1

2025-2026

Muntadher.saleh.mahdi@uomus.edu.iq

UOMU0103031



1





Definitions

Prosthetics (Artificial Limbs) are external devices that replace missing body parts.

They are designed to restore mobility, function, and when possible, natural appearance.

Example: BK prosthesis – AK prosthesis



Orthotics (Braces) are external devices that support, prevent, or correct deformities of existing body parts.

They are applied when the limb or body part is still present but weak, deformed, or injured.

Example: An ankle-foot orthosis (AFO) used for patients with drop foot.



Key Differences Between Prosthetics and Orthotics



Aspect	Prosthetics	Orthotics
Purpose	Replace a missing body part	Support or improve an existing body part
Example Device	Above-knee prosthesis	Knee-ankle-foot orthosis (KAFO)
Users	Amputees (trauma, vascular disease, cancer, congenital absence)	Patients with deformities, weakness, or neurological conditions
Design Focus	Restoring lost body part and function	Assisting or correcting remaining body part
Psychological Role	Strongly tied to body image and self-identity	Focused on mobility, pain relief, and functional correction

Prosthetics vs Orthotics Challenge



1. Strongly tied to body image and self-identity.
2. Focused on mobility and pain relief.
3. AFO.
4. Mainly for patients with deformities or weakness.
5. Supports or improves an existing body part.
6. Replaces a missing body part.
7. BK.
8. Mainly for amputees.



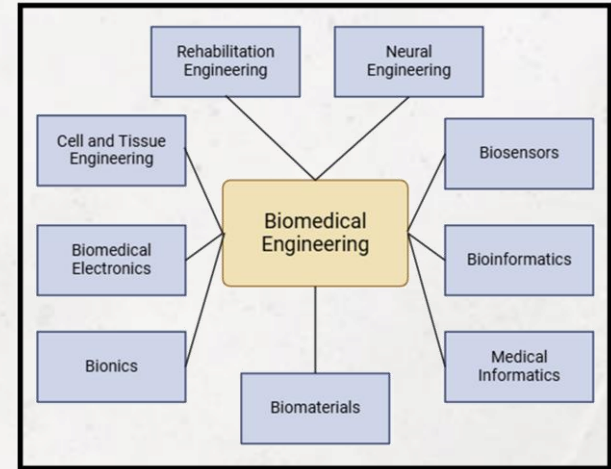
The Importance of Prosthetics and Orthotics



- Both fields aim to restore independence and improve quality of life.
- They combine engineering, medicine, and rehabilitation sciences.

The role of P&O Engineer:

- Biomechanical design.
- Material selection.
- Fabrication and fitting.
- Patient education and follow-up.



Interdisciplinary teamwork is essential: prosthetists/orthotists work closely with physicians, physiotherapists, surgeons, and patients.

6

Understanding Prosthetic Feet: Individuality of Amputees



Every person with an amputation is unique. Differences in anatomy, lifestyle, and personal goals mean that no two prosthetic prescriptions are identical.

The choice of prosthetic foot influences:

- Safety and stability.
- Energy efficiency and performance.
- Comfort and user satisfaction.



Therefore, selecting the right prosthetic foot is not simply a technical choice; it is a patient-centered decision.



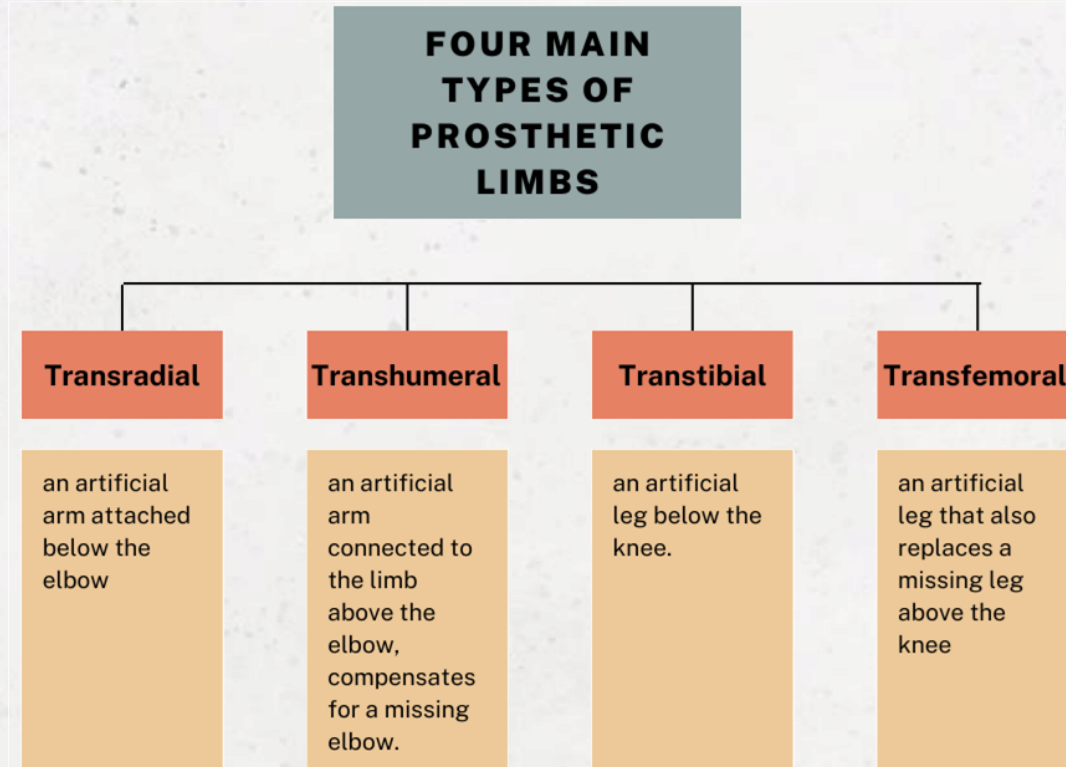
Customization and Maintenance

- Prostheses must be tailored to the patient's weight, activity level, and goals.
- As life circumstances change (aging, activity modification, or medical conditions), prosthetic components may need replacement or adjustment.
- Regular monitoring is essential to maintain performance and prevent damage.



Main Types of Prostheses

By level of amputation:



Main Types of Prostheses



By mechanism:

Cosmetic (passive)

Functional (body-powered or externally powered)



Classification of Functional Potential for Patients

K-levels are a system used to determine a person's functional ability for prosthetic use.



K0: No ability to walk or use a prosthesis.



K1: Can walk on flat surfaces.



K2: Can overcome simple obstacles like curbs and stairs.



K3: Can walk at different speeds and overcome most obstacles.



K4: Can perform high-level activities, like running or playing sports, often seen in active adults, children, and athletes.



