



الهندسة مرتبطة بالسلامة



Al-Mustaqbal University

Collage of Engineering

Prosthetics and Orthotics Engineering

Second Stage

PRINCIPLES OF PROSTHETICS AND ORTHOTICS

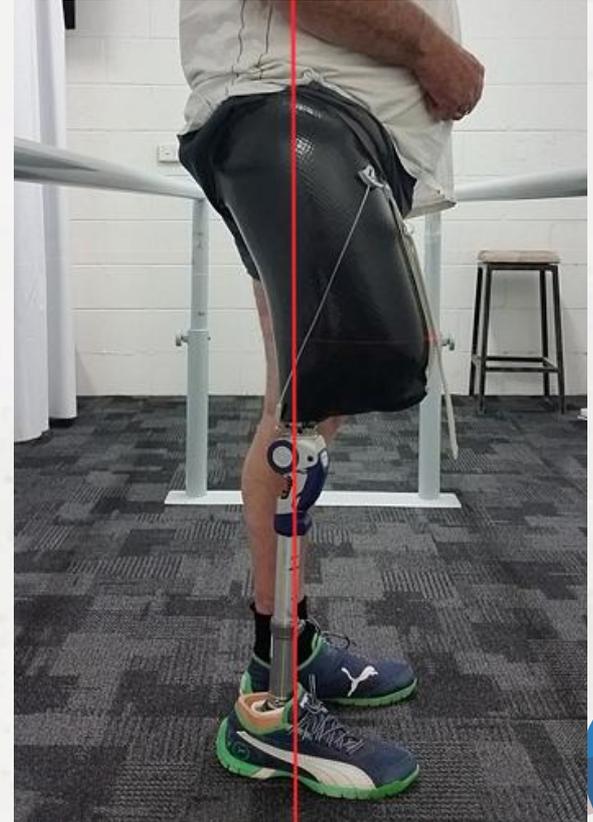
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1st term – Lecture 6

2025-2026

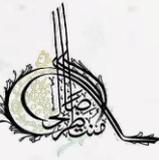
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UOMU0103031



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Components of a Prosthesis



- Socket (interface with residual limb)
- Suspension and liners
- Pylon/shank (structural support)
- Knee unit (for transfemoral prostheses)
- Foot/ankle module



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Patient Assessment & Measurement



- Residual limb inspection: skin, volume, sensitivity, shape
- Gait analysis and activity level (K-levels)
- Recording alignment landmarks and limb length
- Casting vs. digital scanning





- Load distribution: pressure-tolerant vs. pressure-sensitive areas
- Suspension strategy: suction, vacuum, sleeve, locking pin
- Socket types: patellar-tendon-bearing, total contact, quadrilateral
- Comfort, stability, and range of motion considerations



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Materials & Workshop Tools



- Common materials: thermoplastics (e.g., polypropylene), laminates (fiberglass, carbon fiber), resins
- Liners: silicone, urethane
- Tools & equipment: vacuum forming table, grinders, laminating tools, ovens, CAD/CAM scanners



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Fabrication Workflow

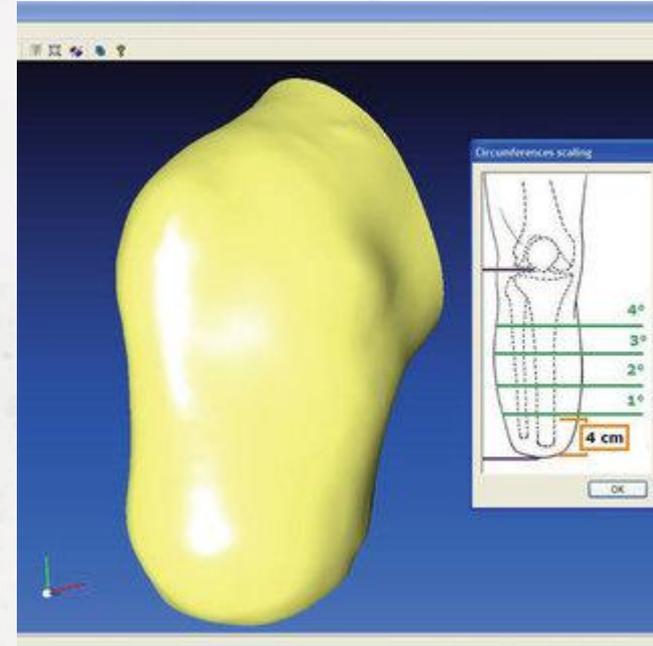


- Cast or scan the residual limb
- Create positive model and perform modifications (rectification)
- Produce diagnostic (check) socket
- Evaluate and modify during fitting
- Fabricate definitive socket and assemble components





- ❑ Hand-trimmed diagnostic sockets (thermoplastic vacuum-formed)
- ❑ Lamination (hand lay-up with resin and fiber)
- ❑ Heat-forming and vacuum-forming for thermoplastics
- ❑ CAD/CAM and 3D printing workflows (digital modifications, print, finish)

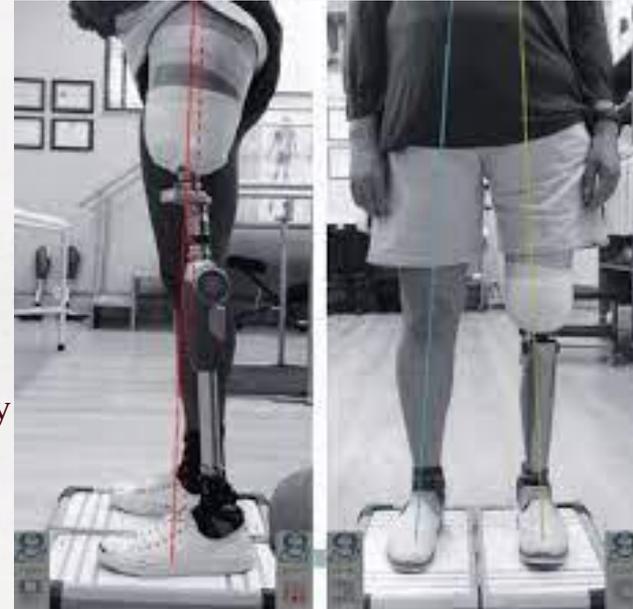


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Alignment & Component Assembly

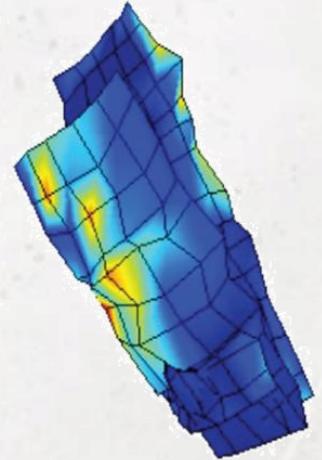


- ❑ Bench alignment: setting initial centerlines and heights
- ❑ Static alignment: limb length, foot alignment, socket orientation
- ❑ Dynamic alignment: observe gait and adjust for comfort and energy efficiency
- ❑ Secure attachment: pyramid adapters, bolts, pylon clamps





- Trial wear: pressure check, don/doff practice, suspension test
- Gait training and progressive activity prescription
- Monitoring for skin breakdown, pain, and fit changes
- Documentation of adjustments and follow-up schedule





- Visual inspection and mechanical testing of joints/connectors
- Fit verification: pressure mapping or clinical palpation
- Infection control and workshop safety (dust extraction, PPE)
- Regulatory and record-keeping practices



