



الجامعة المستقبالية



Al-Mustaqbal University

Collage of Engineering

Prosthetics and Orthotics Engineering

Second Stage



Ansys

PRINCIPLES OF PROSTHETICS AND ORTHOTICS

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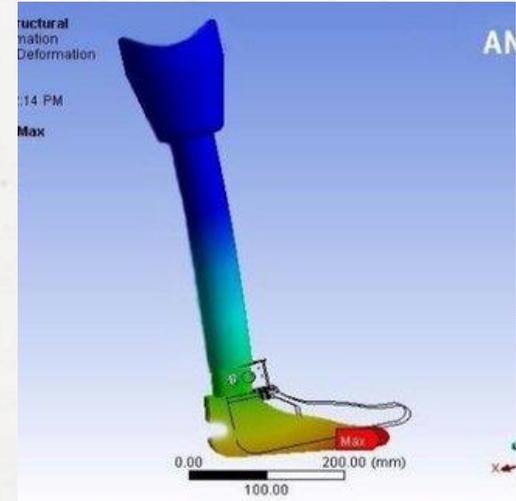
1

Introduction to ANSYS



ANSYS is one of the most widely used engineering simulation programs. It is based on the principles of Finite Element Analysis (FEA), which is a method for predicting how objects respond to real-world forces, vibration, heat, fluid flow, and other physical effects.

In the field of Prosthetics and Orthotics Engineering, ensuring that devices are **safe**, **comfortable**, and **durable** is a major priority. ANSYS provides a powerful tool that allows engineers to simulate and test these devices **virtually**, which reduces both time and cost while improving accuracy.

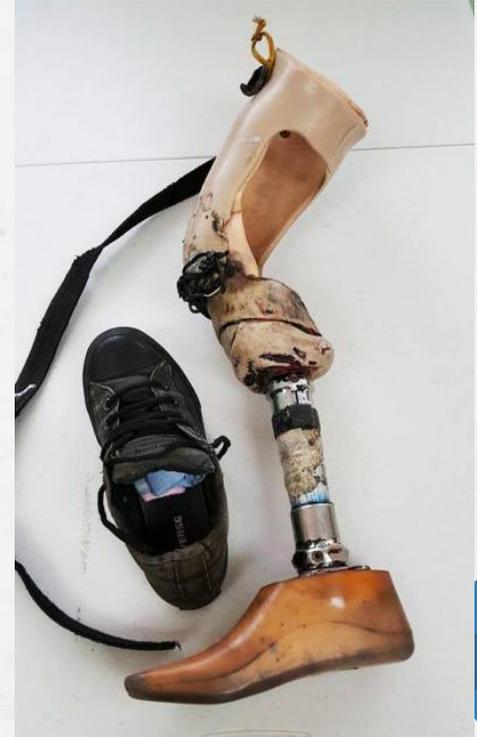


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Advantages of Using ANSYS



Traditional design methods depend heavily on trial and error, which can be expensive and time-consuming. ANSYS reduces the need for repeated prototyping because it allows engineers to simulate many designs on the computer. This approach saves **time**, **cost**, and **effort**. It also improves accuracy by providing detailed information about stress, strain, and deformation in the device. For prosthetics and orthotics, this means the final product can be **lighter**, **stronger**, and more **comfortable**. Overall, ANSYS gives students and engineers a scientific method to improve their designs.

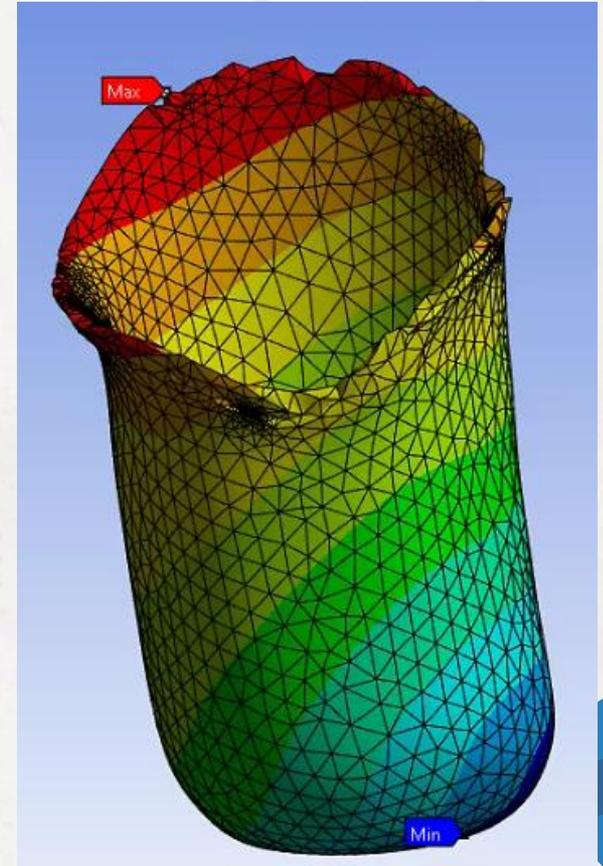


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Structural Analysis of Devices

One of the main functions of ANSYS is **structural analysis**. This type of analysis helps engineers understand how a prosthetic or orthotic device behaves under body weight or movement forces. For example, when a patient walks with a prosthetic limb, different parts of the device experience stress and deformation. ANSYS can simulate these forces and show where the material is strong and where it may fail. This information is critical for designing devices that are **safe, reliable, and comfortable** for daily use.



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Materials Testing



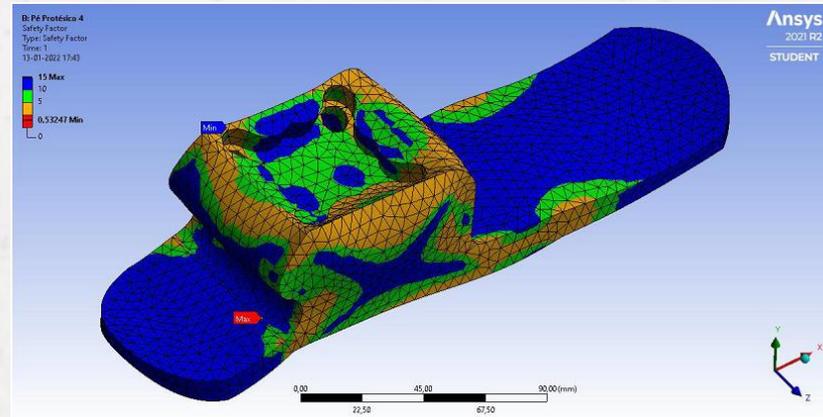
ANSYS can also compare different materials such as aluminum, carbon fiber, and plastics. For example, it can show if carbon fiber is lighter but still strong enough, or if aluminum is a better choice for a certain part?. **This helps in selecting the right material for the patient's needs.**



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Examples in Practice

- **Prosthetic socket:** ANSYS can show how pressure is distributed on the socket wall.
- **Orthotic brace:** It can test if a KAFO (knee-ankle-foot orthosis) can safely carry the body's weight.
- **Prosthetic foot:** Simulation shows how the foot bends during walking and checks if it is strong but still flexible.



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Steps in ANSYS



The general steps are simple:

- Build the model.
- Add material properties.
- Create the mesh (small elements).
- Apply loads and boundary conditions.
- Run the analysis.
- Check the results in the form of colors, graphs, or animations.

