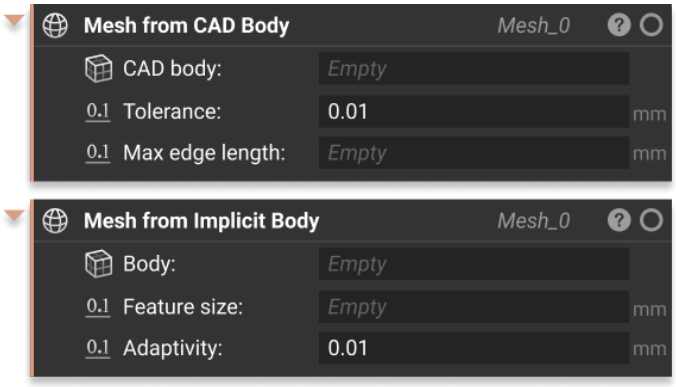
Follow Along: Creating an FE Mesh

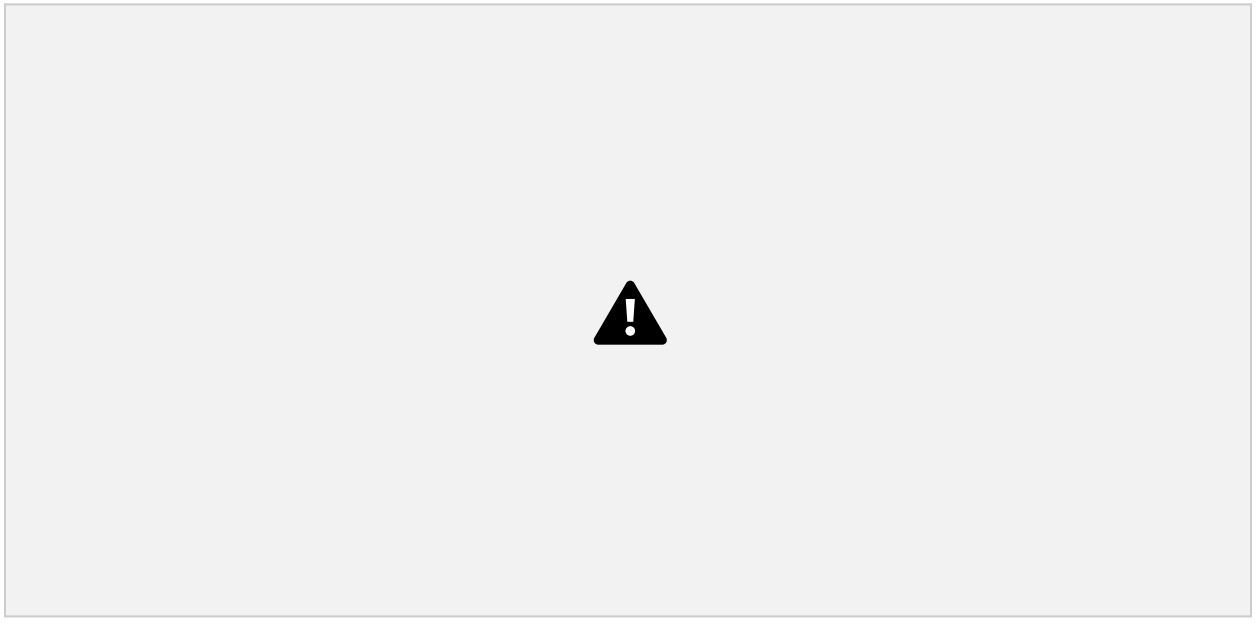
This lesson walks through how to create an FE Volume Mesh of a brake pedal by first importing the CAD part below, converting it to a mesh, remeshing the surface, using the **Volume Mesh** block, and then the **FE Volume Mesh** Block.

Please download the CAD File below to follow along with the tutorial.

Step 1: To create an FE Mesh, you need to take your starting geometry and convert it into a Surface Mesh (if it isn't already). Use either the **Mesh from CAD Body** block or **Mesh from Implicit Body** depending on your starting geometry.



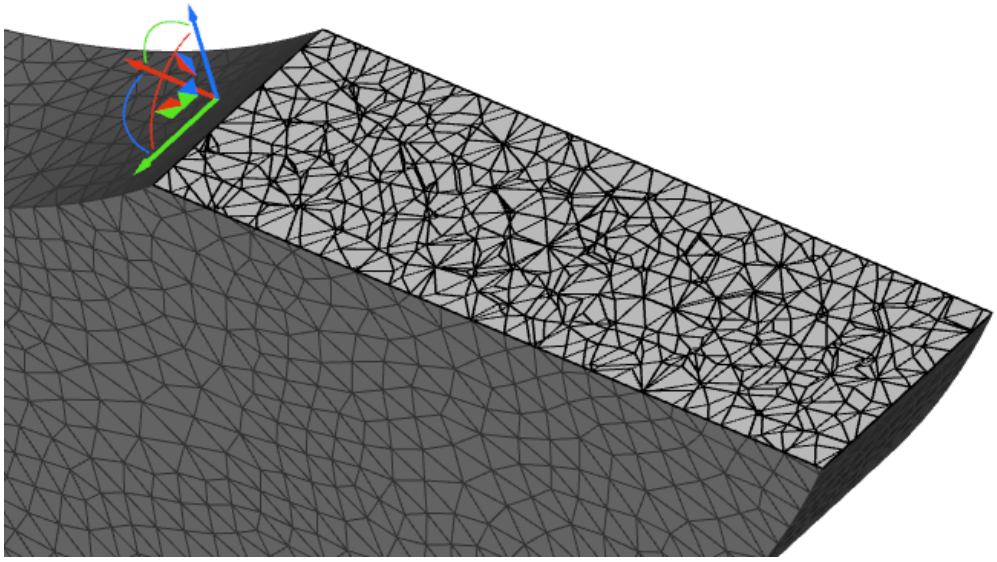
Step 2: Remeshing the surface mesh creates equally sized polygons in the mesh, allowing for an easier transition to a volume mesh. Do this by using the **Remesh Surface** block. Further refinement may be necessary for complex models.



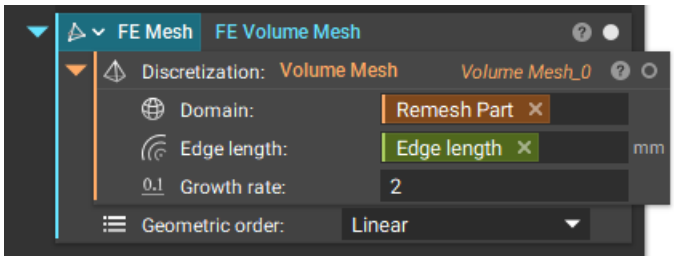
Last updated on January 3, 2022 with version 3.16.3.

Step 3: Convert the Surface mesh into a Solid Mesh by using **Volume Mesh** or **Robust Tetrahedral Mesh**. **Volume Mesh** is effective if the input domain is mostly error-free, and **Robust Tetrahedral Mesh** is exceptionally tolerant of complex geometry but takes longer to compute. It is best practice to keep the *Edge Length* the same for both the Surface Mesh and the 3D Mesh, so it is easier to form tetrahedrons. One way to ensure the Edge Length is the same is to turn it into a variable that is used in both the Remesh and Volume Mesh blocks (need to review how to create variables? Check here).

The image below shows a section cut Volume Mesh, where the Edge Length was the same value.



Step 4: Convert the Solid Mesh into a Finite Element Mesh by using **FE Volume Mesh**. This conversion adds integration points within the mesh. The Linear option inserts nodes at the vertices of elements, while the Quadratic option inserts mid-side nodes along the straight edges of elements. Curved elements are not supported.



Extra: FE Meshes can be exported out of the program. To do so, right-click on the FE Mesh block to **Export** as an INP, CDB, BDF, K, or UNV. Check here for more information on exporting FE data.