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FEM Mesh preparation and quality inspection

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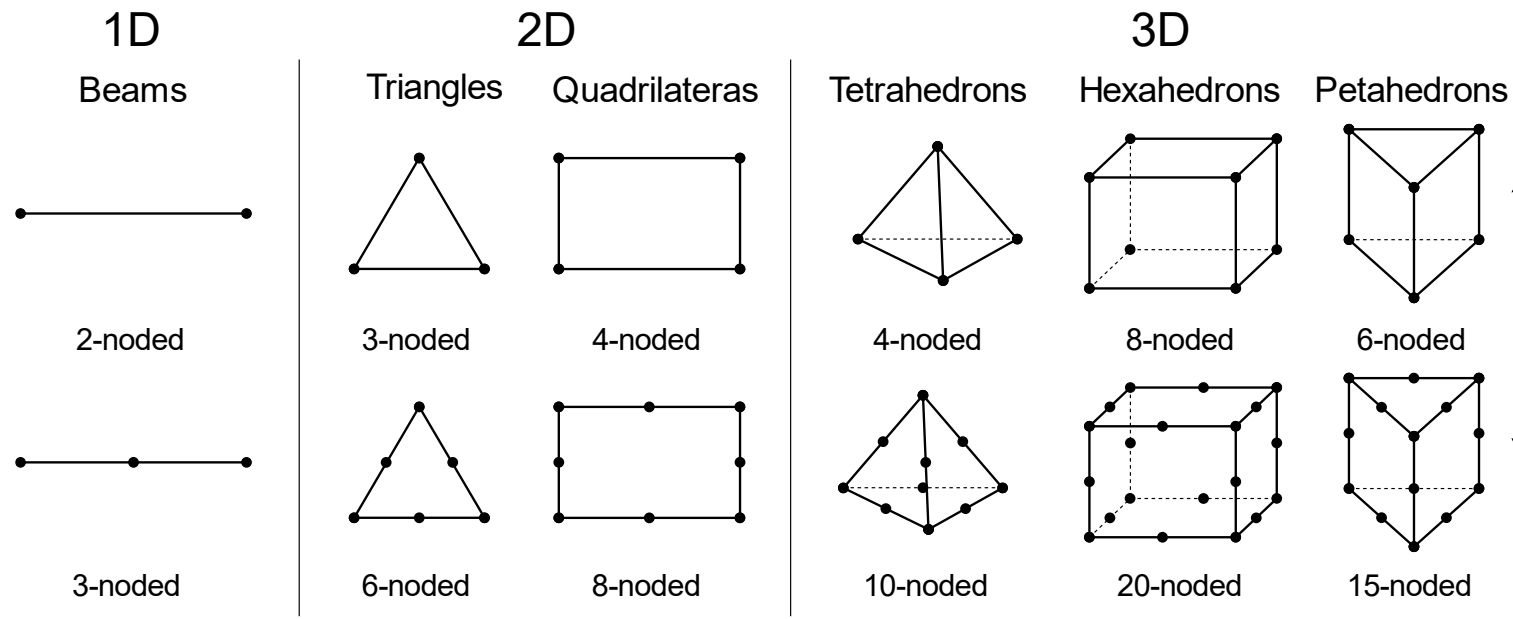
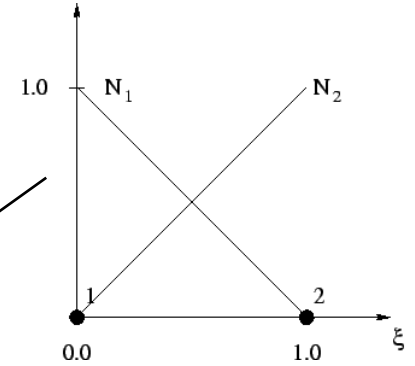
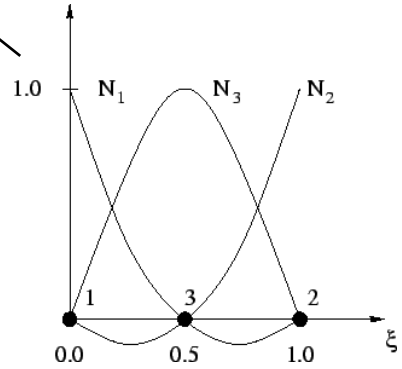
Finite element (FE) types



Linear shape functions (SF):



Quadratic SF:



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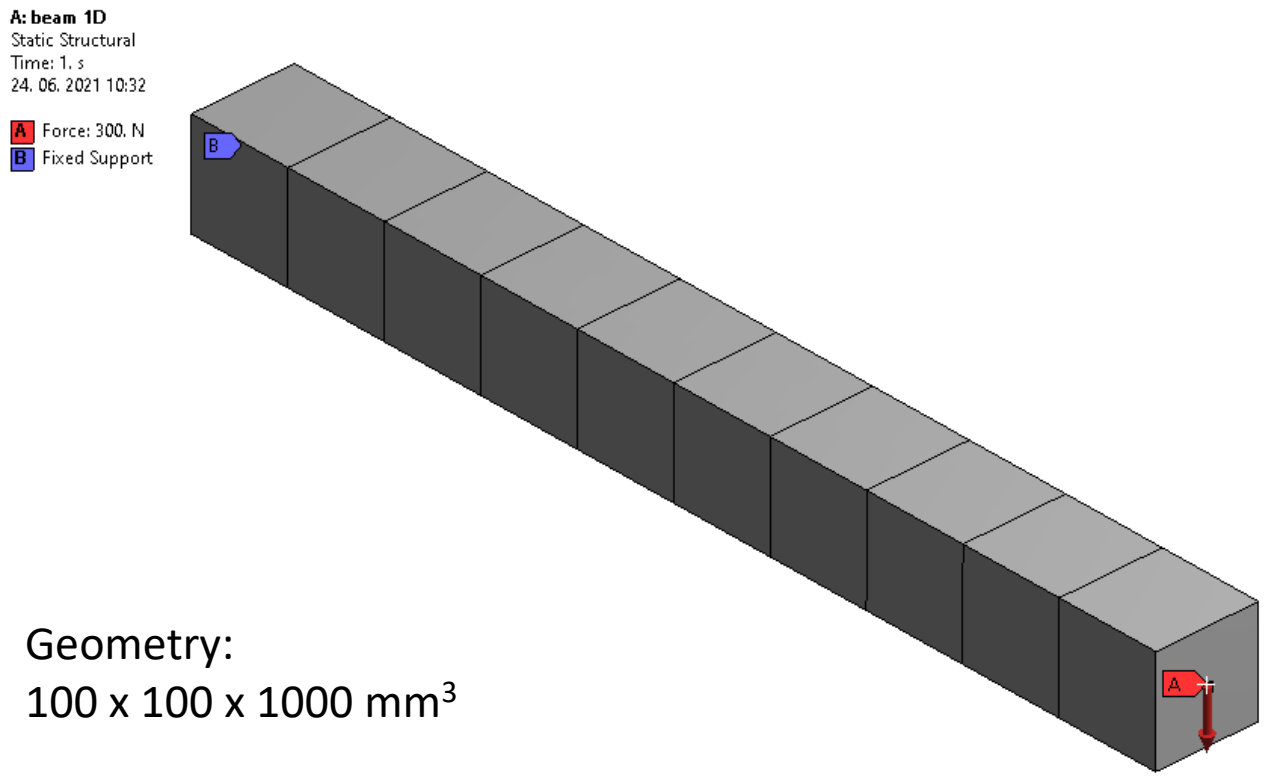
Case 1: 1D FEs in 3D space

Details View

Details of Point2	
Point	Point2
Type	Construction Point
Definition	Manual Input
# Points generated	1
Point Group 1 (RMB)	
FD8, X Coordinate	1 m
FD9, Y Coordinate	0 m
FD10, Z Coordinate	0 m

Details of "Rect1"

Definition	
Type	RECT
Import Type	Imported
Dimensions	
B	100. mm
H	100. mm
Physical Properties	
Beam Section	Rect1
A	10000 mm²
Iyy	8.3333e+006 mm²·mm²
Izz	8.3333e+006 mm²·mm²



Geometry:
100 x 100 x 1000 mm^3

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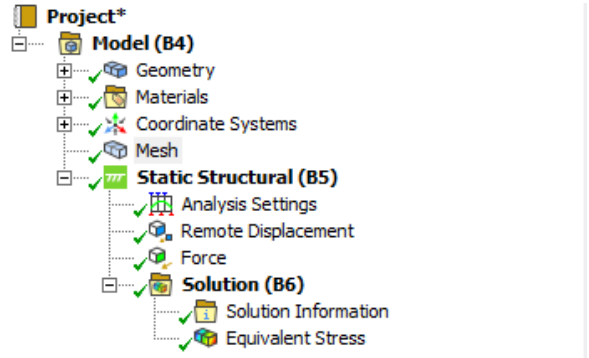
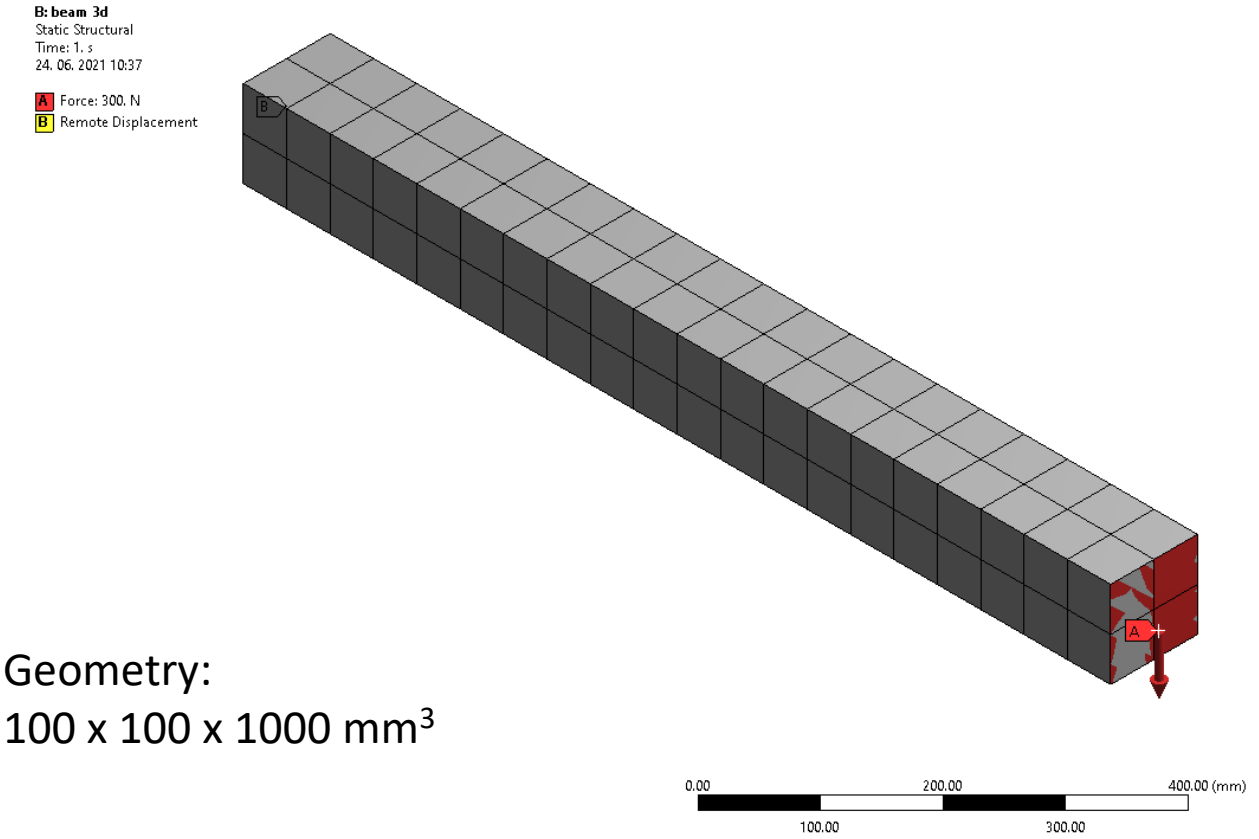
Case 2: 3D FEs (quadratic element order) in 3D space



Details of "Mesh"

Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Mechanical
Element Order	Quadratic
Element Size	Default
Sizing	
Quality	
Inflation	
Advanced	
Statistics	



Geometry:
100 x 100 x 1000 mm^3

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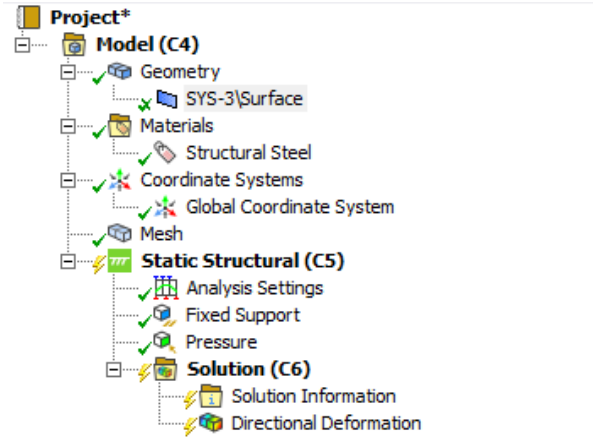
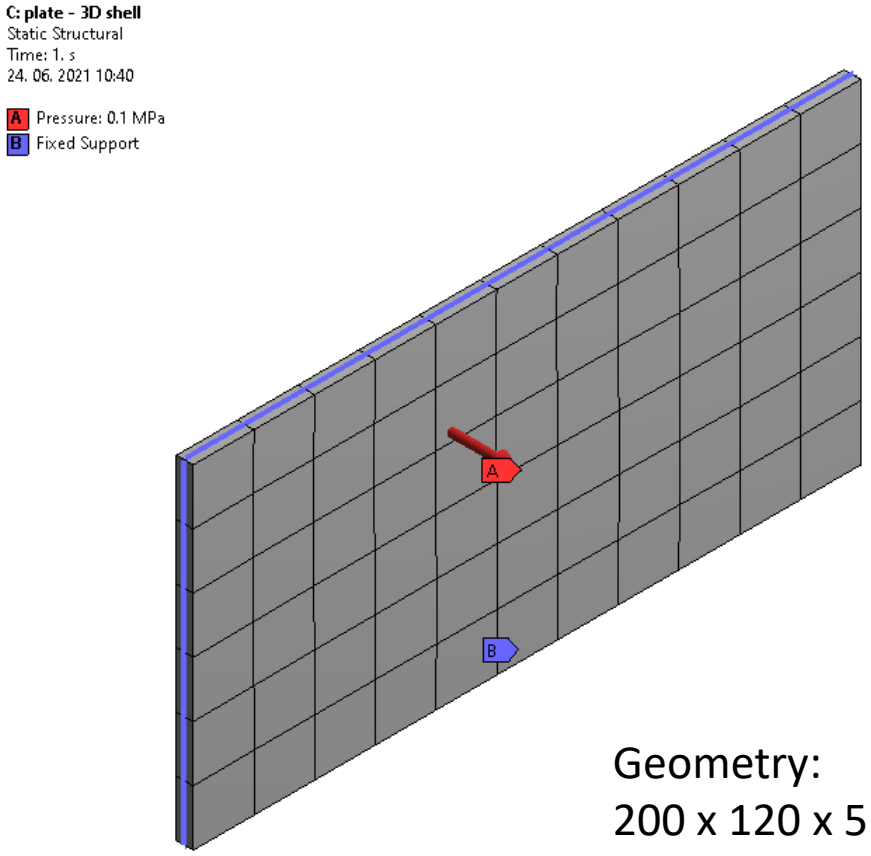
Case 3: 2D shell FEs in 3D space



Details of "SYS-3\Surface"

Graphics Properties	
Definition	
Suppressed	No
Dimension	3D
Stiffness Behavior	Flexible
Coordinate System	Default Coordinate System
Reference Temperature	By Environment
Thickness	5. mm
Thickness Mode	Manual
Offset Type	Middle
Treatment	None



Geometry:
200 x 120 x 5 mm^3

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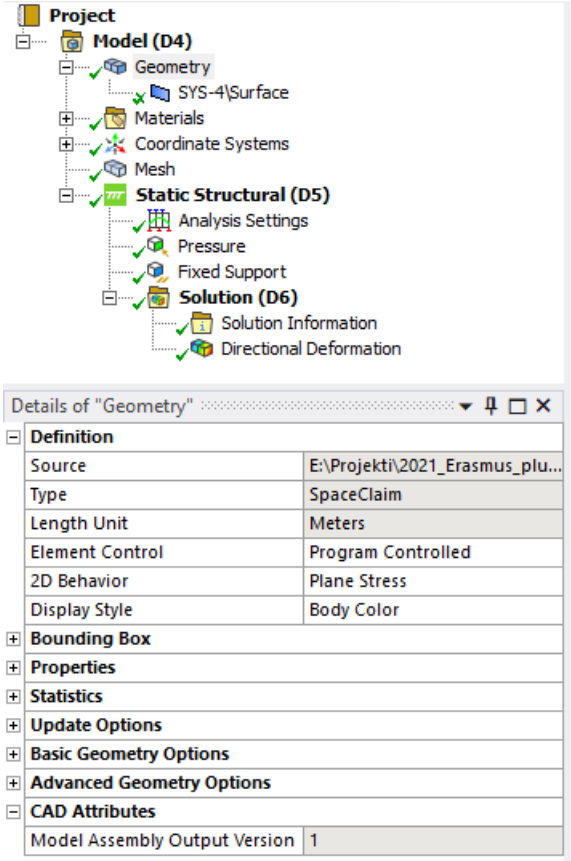
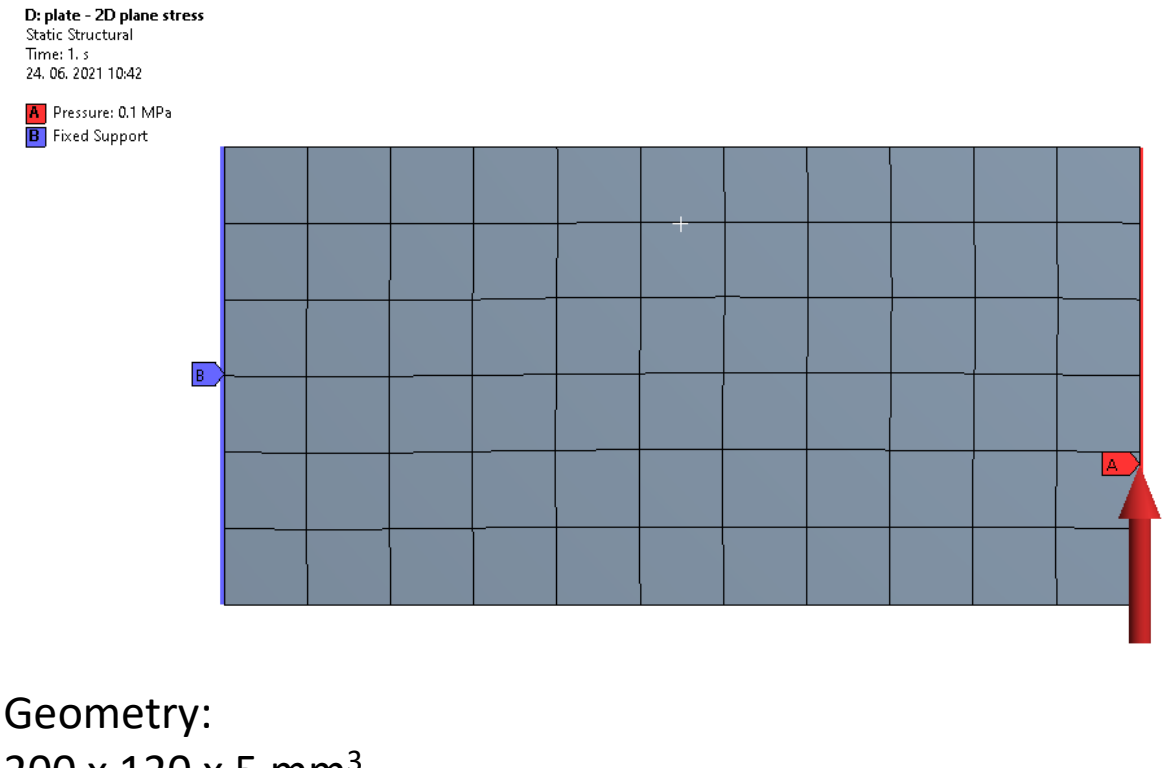
Case 4: 2D FEs in 2D space (plane stress and plane strain)



Details of "Geometry"

Definition	
Source	E:\Projekti\2021_Erasmus_plu...
Type	SpaceClaim
Length Unit	Meters
Element Control	Program Controlled
2D Behavior	Plane Stress
Display Style	Body Color
Bounding Box	
Properties	
Statistics	
Update Options	
Basic Geometry Options	
Advanced Geometry Options	
CAD Attributes	
Model Assembly Output Version	1



Geometry:
200 x 120 x 5 mm^3

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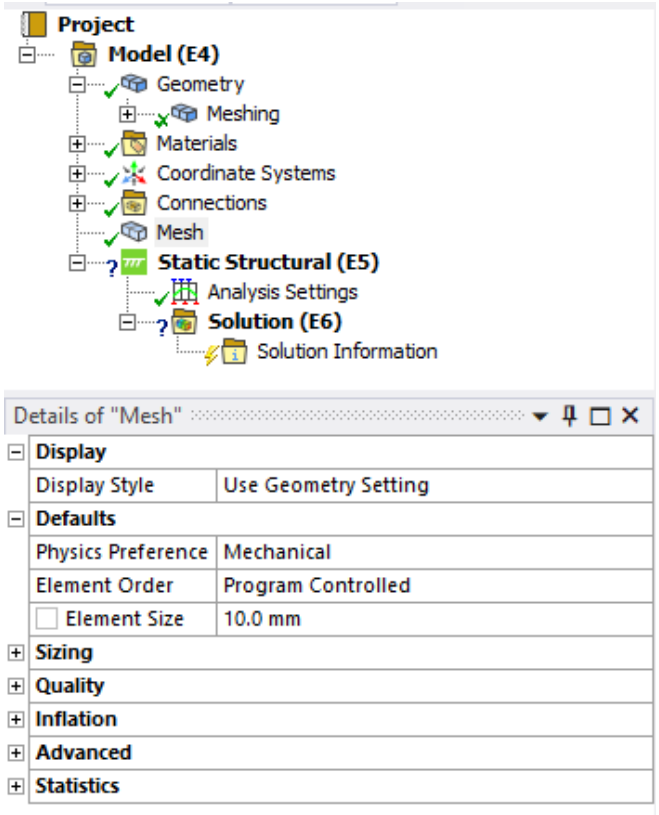
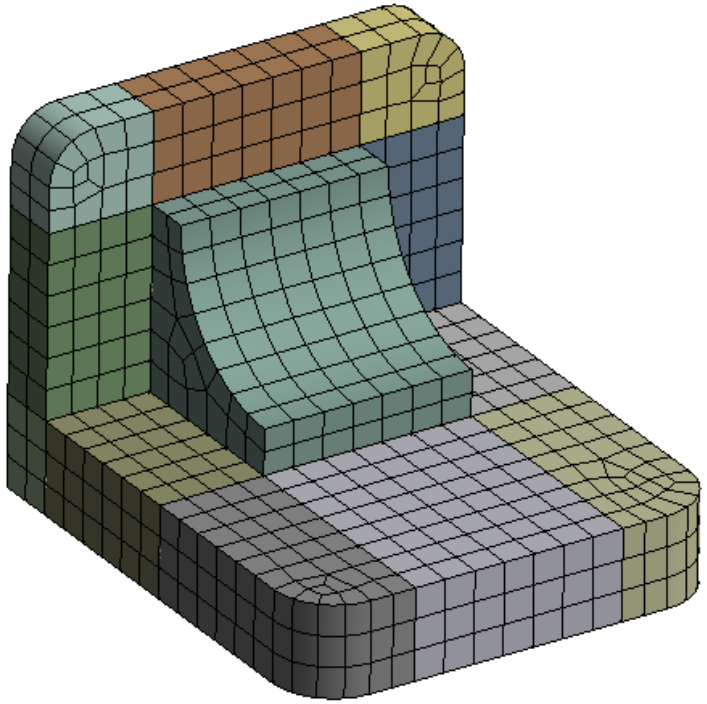
Case 5: Structured 3D FE mesh





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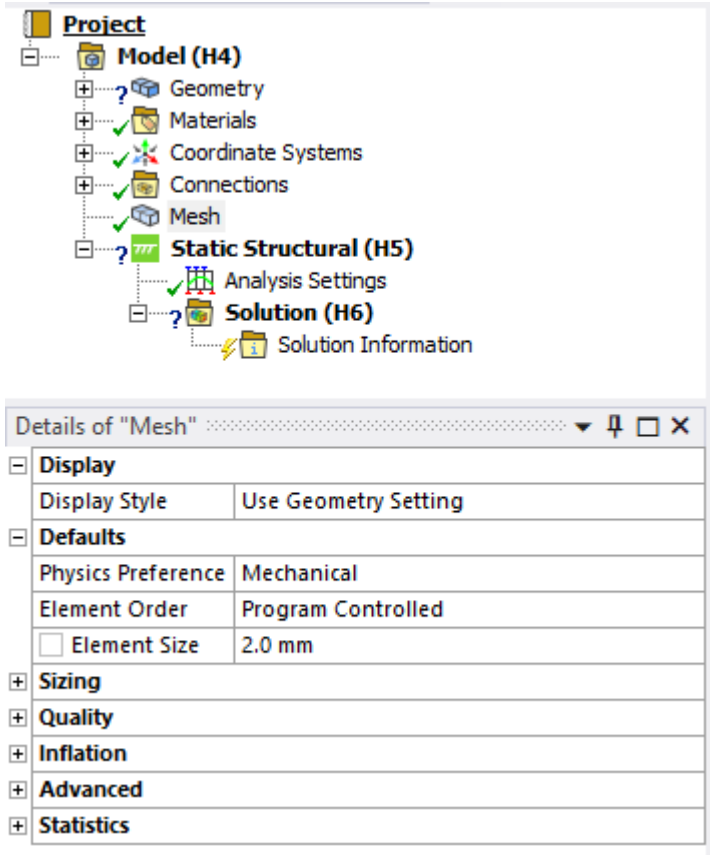
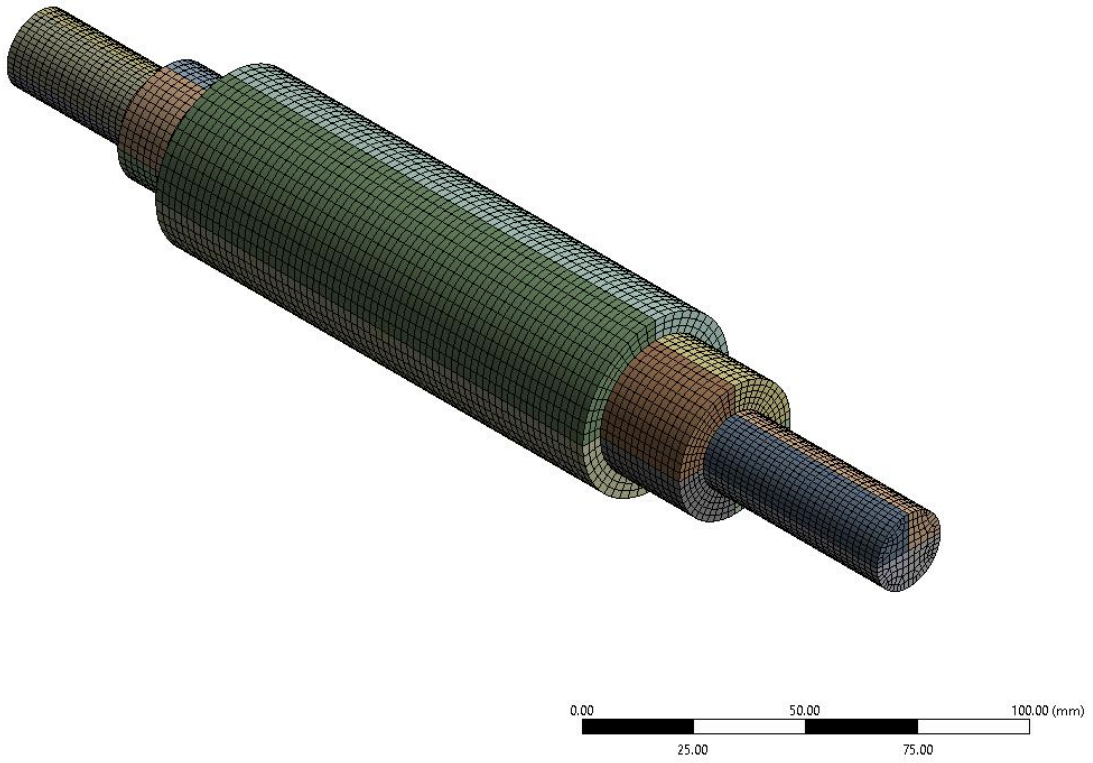
- Case 6: Structured 3D FE mesh (cylindrical bodies)





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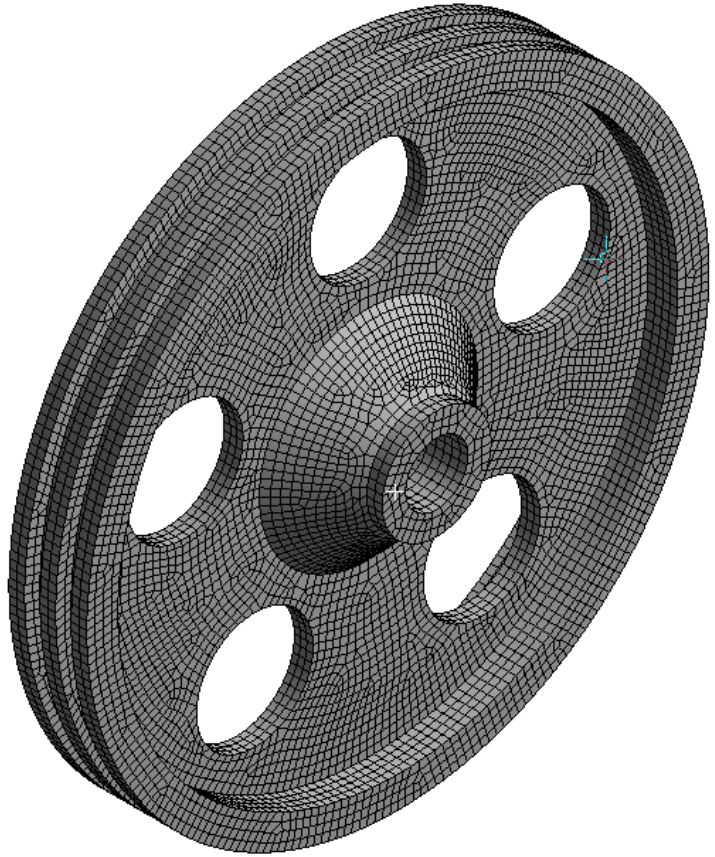
Indivudual work case 1: Structured 3D FE mesh (wheel)

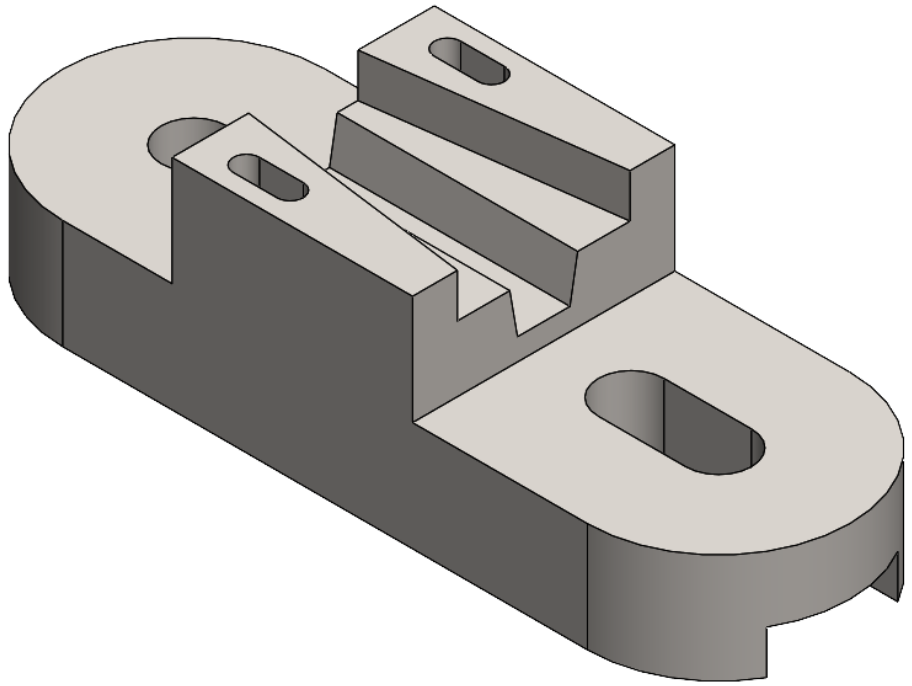
- Upload geometry from file *Wheel_Meshing_defeatured.x_t*
- Try to reach at least 80 % element quality using (predominantly) hexagonal FEs
- Hint – use either
  - Geometry slicing or
  - Mesh method – Hex dominant or
  - Both methods combined



FE Mesh preparation and quality

Indivudual work case 1: Structured 3D FE mesh (3D body)

- Upload geometry from file *Meshing_block_2.x_t*
- Try to reach at least 80 % element quality using (predominantly) hexagonal FEs
- Hint – use either
  - Geometry slicing or
  - Mesh method – Hex dominant or
  - Both methods combined



Thank you for your attention!

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