Project – 1

Semi-circular Obstacle in a channel

The objective is to simulate the flow over a semicircular obstacle using the python scripting in ANSYS PyFluent. The learning objectives are –

Develop the python script for ANSYS Watertight meshing workflow with following steps –

- Import the geometry
- Local size refinement (BOIs)
- Generate the surface mesh
- Define geometry
- Update regions
- Add boundary layer – (smooth transition method)
- Generate the volume mesh – (keeping the default size)

For the Fluent solver –

- Viscous model selection
- Adding materials (other than default)
- Adding the boundary conditions
- Initialization
- Solving the problem
- Plotting the contours using PyFluent Core
- Plotting the pressure and wall shear stress along a surface

CAD model -

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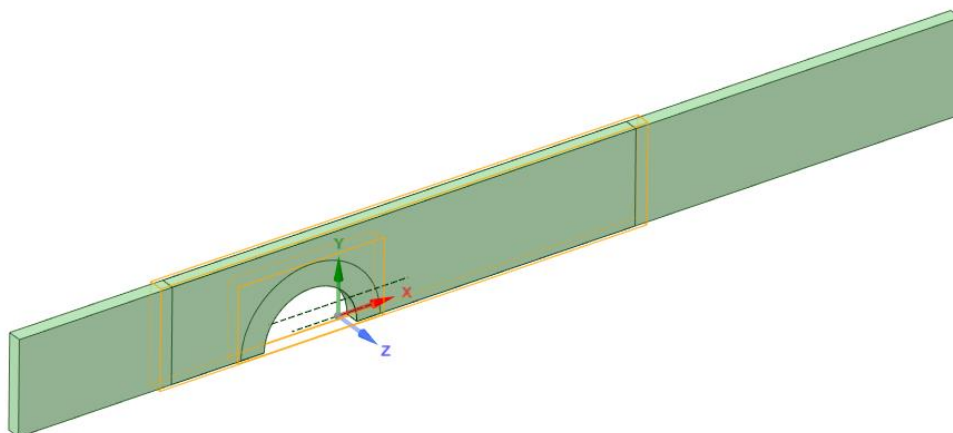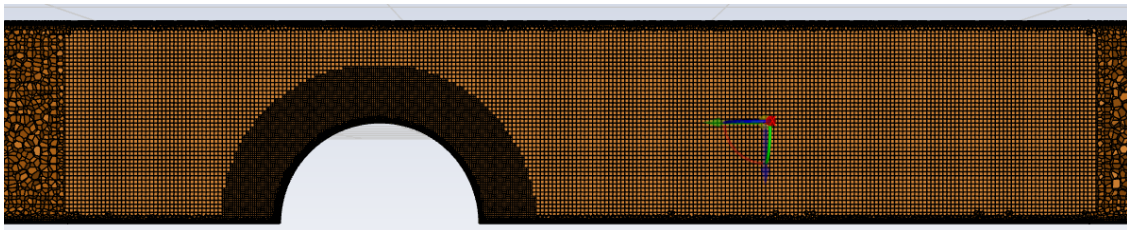
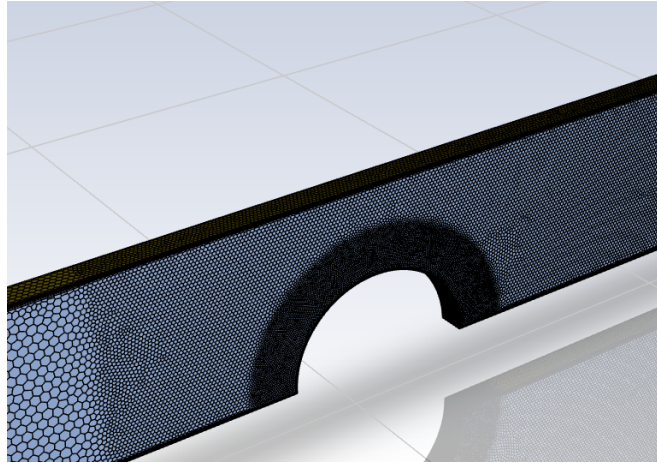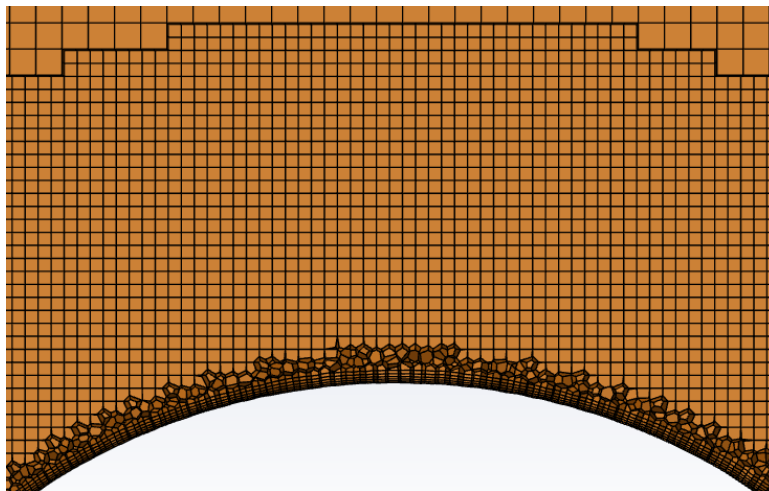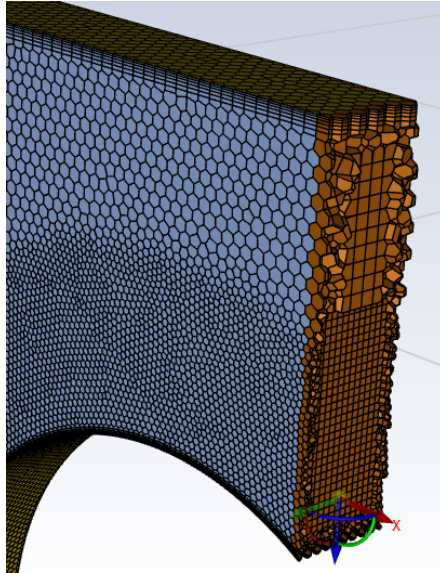Geometric dimensions –

- Semi-circle radius – 50 mm
- Cross-section area – 100 mm * 15 mm
- Up-stream (semi-circle) length – 250 mm
- Downstream (semi-circle) length – 800 mm

Meshing Images -

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Results –

- Fluid = water-liquid
- Inlet = 10 m/s flow velocity
- Viscous model = k-omega (SST)

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velocity_contour
Velocity Magnitude

2.40e+01	
2.16e+01	
1.92e+01	
1.68e+01	
1.44e+01	
1.20e+01	
9.62e+00	
7.21e+00	
4.81e+00	
2.40e+00	
0.00e+00	

[m/s]

pressure_contour
Static Pressure

7.22e+04	
4.37e+04	
1.52e+04	
-1.33e+04	
-4.17e+04	
-7.02e+04	
-9.87e+04	
-1.27e+05	
-1.56e+05	
-1.84e+05	
-2.13e+05	

[Pa]

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turbulence-energy_co
Turbulent Kinetic Ener

1.60e+01
1.44e+01
1.28e+01
1.12e+01
9.61e+00
8.01e+00
6.41e+00
4.81e+00
3.21e+00
1.60e+00
2.60e-03
[m^2/s^2]

wall_lower
wall_upper

Static Pressure [Pa]

1.00e+05
5.00e+04
0.00e+00
-5.00e+04
-1.00e+05
-1.50e+05
-2.00e+05
-2.50e+05

-400   -200   0   200   400   600   800

Position [mm]

Front stagnation point

separation on obstacle

top of obstacle

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