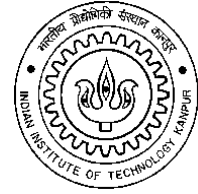


AE 618A: Finite Element Method for Fluid Dynamics  
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## Assignment - 3

Consider the 2D steady linear heat conduction in a plate with a hole. You may assume the geometry of the plate and hole as per your choice. For example, a circular hole in a circular plate. Or, a triangular hole in a rectangular plate. The choice is entirely yours. The temperature of the outer boundary is 0 while it is 1 at the boundary of the hole. You have to find the steady state temperature in the plate. Assume the heat conductivity is constant. Also, there is no heat source.

1. Write the strong form of the problem.
2. Write the weak form of the problem.
3. Using bilinear shape functions in 2D, write the element level matrices and vector.
4. Generate a finite element mesh
5. Write a shape function subroutine
6. Write a finite element program to assemble the global stiffness matrix and force vector.
7. Find the solution
8. Plot it
9. Discuss the solution.