

# ANSYS - 2D Steady Conduction

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Problem Specification

1. Pre-Analysis
  2. Geometry
  3. Mesh
  4. Model Setup
  5. Numerical Solution
  6. Numerical Results
  7. Verification & Validation
- Exercises  
Comments

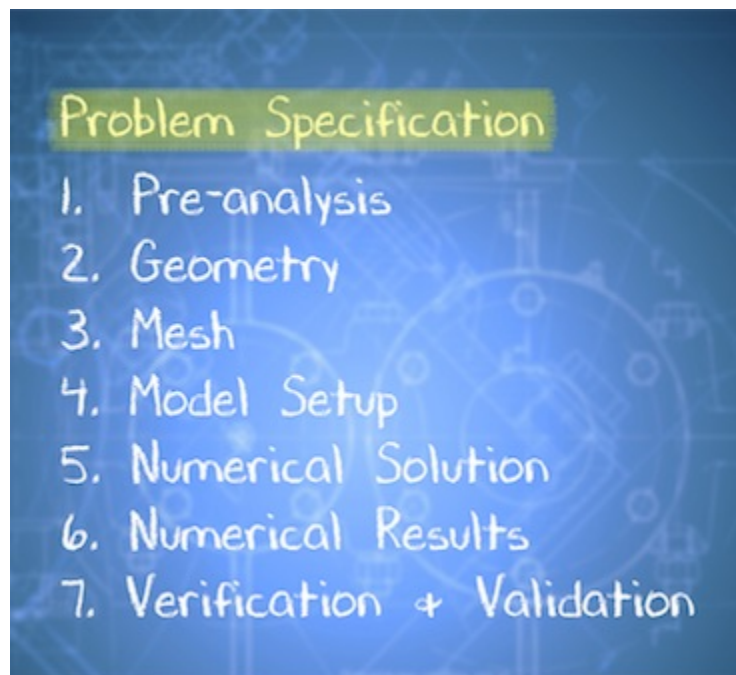
## 2D Steady Conduction in a Rectangular Domain

Created using ANSYS 16.2

**i** This module is from our [free online simulations course](#) at [edX.org](#) (sign up [here](#)). The edX interface provides a better user experience, so we recommend that you go through the module [t here](#) rather than here. Also, you will be able to see answers to the questions embedded within the module there.



This tutorial has videos. If you are in a computer lab, make sure to have head phones.



### Learning Goals

In this module, you'll learn to:

- Develop the solution to a 2D heat conduction problem in ANSYS Mechanical
- Verify the numerical results from ANSYS
- Connect the ANSYS steps to concepts covered in the [Big Ideas: Finite Element Analysis](#) section (in the online [edX course](#)).

## Handouts

- Powerpoint slides used in the videos: [Before markup](#)
- Powerpoint slides used in the videos: [After markup](#)

## Problem Specification

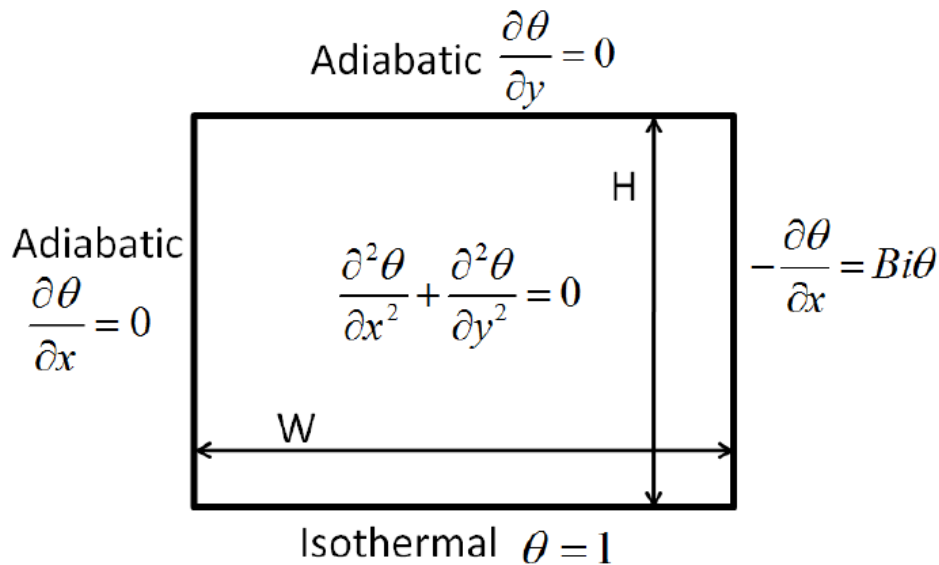
This module is drawn from [MAE 3240 Heat Transfer](#) at Cornell University.

Consider steady ( $\partial/\partial t = 0$ ) conduction in a two-dimensional (cartesian  $x$  and  $y$ ) rectangular domain of width  $\Delta x = W$  and height  $\Delta y = H$ , with constant conductivity  $\kappa$ , subject to an isothermal bottom boundary with Temperature  $T = T_0$ , adiabatic top ( $\partial T/\partial y = 0$ ) and left ( $\partial T/\partial x = 0$ ) walls, and with a right boundary exposed to a fluid at  $T = T_\infty$  with constant convection coefficient  $h$ . Defining the dimensionless temperature

$$\theta \equiv \frac{T - T_\infty}{T_0 - T_\infty},$$

and coordinates  $x^* \equiv x/W$  and  $y^* \equiv y/H$ , we can rewrite the dimensionless problem as shown in the figure below, where the asterisks have dropped for simplicity. In this tutorial, we will adopt the aspect ratio  $H^* \equiv H/W = 2$  and Biot number  $Bi \equiv hW/\kappa = 5$

Find the dimensionless temperature distribution as well as the dimensionless heat flux using ANSYS Workbench.



(The above problem statement has been provided by Prof. Michel Louge, Cornell University.)

[Go to Step 1: Pre-Analysis](#)

[Go to all ANSYS Learning Modules](#)