# ANSYS - 2D Steady Conduction

Author: Rajesh Bhaskaran, Cornell University

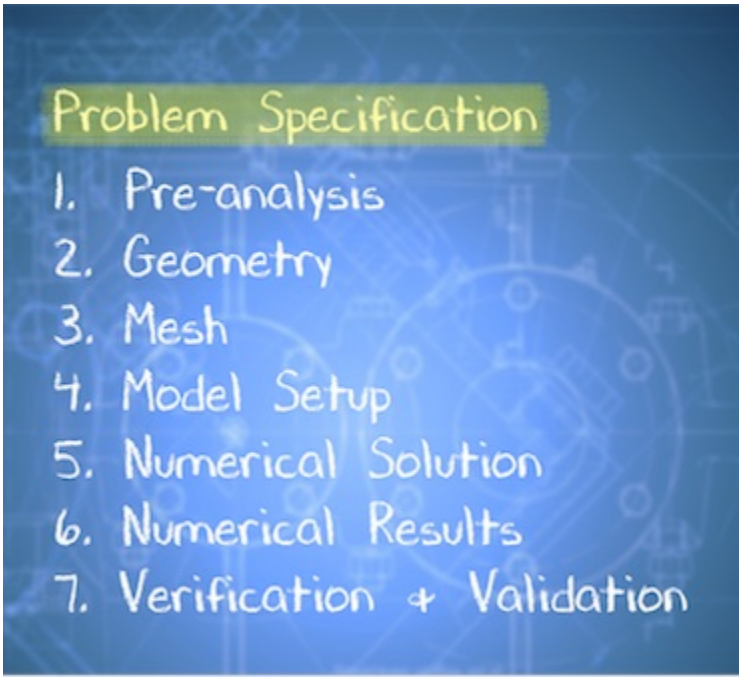


## 2D Steady Conduction in a Rectangular Domain

Created using ANSYS 16.2

**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

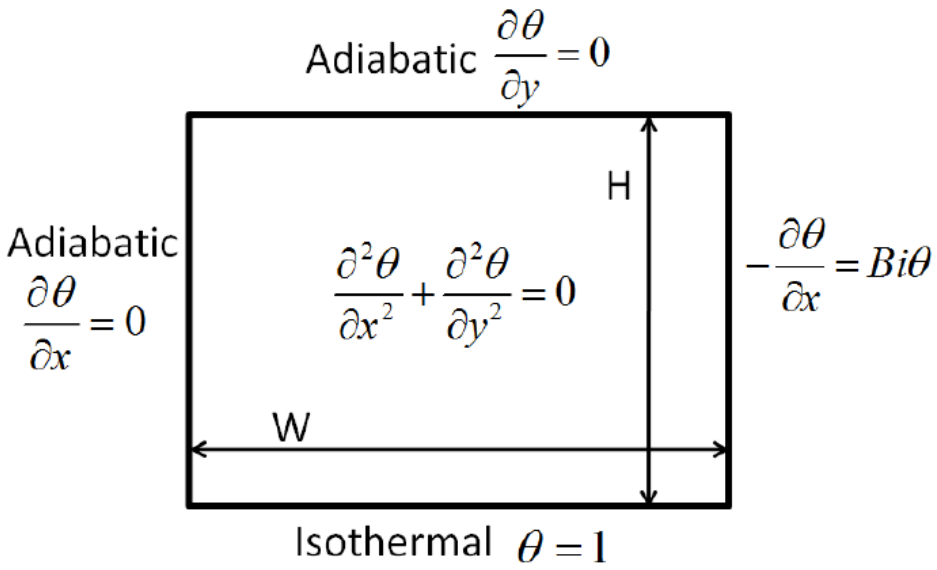
This module is drawn from MAE 3240 Heat Transfer at Cornell University.

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 $y^* \equiv y/W$, 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