Commentary on Notation:

It is useful to review so far our notational conventions. We have:

i, j : Global indices for basis functions and control points
a, b : Local (element-wise) indices for basis functions and control points
A, B : Indices for components in a vector (e.g., $\{\vec{C}\}_A$)
e : Element number
p : Polynomial degree*

* or patch, but we will focus on single-patch geometries *

Moreover:

ξ : Global parametric coordinate
$\tilde{\xi}$: Parent parametric coordinate

We have seen that B-splines are a special case of NURBS, so we will henceforth always use the terminology, NURBS. We will also write $N(\xi)$ to refer to any basis function. It is to be understood that this could be a univariate, bivariate, or trivariate, polynomial or rational basis function. To avoid distinguishing between curves, surfaces, and solids, we will refer to a point in the domain at parameter value ξ as $\vec{x}(\xi)$. That is:

$\vec{x}(\xi)$: Geometric map

Similarly, we can localize:

$\vec{x}^e(\tilde{\xi})$: Local geometric map

We also need to be careful when discussing the domain. We denote the domain in physical space as Ω and the domain in parametric space as $\hat{\Omega}$. Thus, $\vec{x} : \hat{\Omega} \to \Omega$ and, in fact, $\vec{x}^{-1} : \Omega \to \hat{\Omega}$. Summarizing:

$\hat{\Omega}$: Domain in Parametric Space
Ω : Domain in Physical Space

We also have multiple definition of elements:

$\hat{\Omega}^e$: Element e in Parametric Space
Ω^e : Element e in Physical Space
$\tilde{\Omega}$: The Parent Element

We have $\vec{x} : \hat{\Omega}^e \to \Omega^e$ and $\vec{x}^e : \tilde{\Omega} \to \Omega^e$ as well as $\vec{x}^{-1} : \Omega^e \to \hat{\Omega}^e$ and $(\vec{x}^e)^{-1} : \Omega^e \to \tilde{\Omega}$. We will repeatedly rely on the aforementioned notation throughout the class.