Physics tackles some of the deepest questions about the universe we live in: How did it begin, and what will its fate be? What are the fundamental constituents of matter and how are they related to each other? What, exactly, are space and time, and where do they come from? Is there a smallest possible distance? ... a shortest possible time?

This course will aim to address at least some of those questions (for others, we simply don't have any answers at the moment!)

We start with a pretty deep investigation into the Special Theory of Relativity – one of Albert Einstein's amazing contributions to our knowledge about the world. It's an easy subject to dive into from a mathematical perspective since all that's needed is algebra and some geometry & trigonometry. From our study, we'll learn to think about space and time as a unified structure for describing what goes on in the universe. We'll also look briefly at the General Theory of Relativity – Einstein's masterpiece, which recast gravity as the warping of space and time. The mathematics underlying this theory is elegant and powerful, but not familiar or quick to learn, so we'll discuss it mainly from a conceptual perspective.

We follow our study of relativity with an exploration into quantum physics – our theory of the microworld. Developed throughout the 20th century, this theory revealed the incredible strangeness of the subatomic actors that constitute all familiar objects. Again, much of the math encountered in studying quantum physics is beyond the scope of our course, but there's a lot we can learn about the conceptual structure of the theory.

Near the end of the semester we'll pull the course material together by looking at some of the implications of relativity and quantum theory for the birth and evolution of the universe. At the beginning of the universe, the very small and very large come together in remarkable ways to set the universal stage, as well as the actors we see strut and fret upon it in the current era, more than 13 billion years after the birth of the universe.

Throughout the course, we will pay attention not just to what physicists have come to understand about the universe, but also to how they made those discoveries and how they developed the models that capture our understanding.

Note: Math 101 is a co-requisite for this course.