Title: Metasurfaces in Antennas and Beyond: From Computational Imaging to Information Encoding

Abstract: Metamaterials are artificially engineered structures that can synthesize material properties that may not be found in natural materials. The unique electromagnetic properties unlocked by metamaterials make them a promising choice for realizing interesting wave phenomena, from synthesizing dual-negative media to enabling structures that can perform computational imaging and information encoding & processing, among many others. In this lecture, we will cover different examples of metamaterials for a variety of emerging applications across the electromagnetic spectrum. First, we will present the full wave control capabilities unlocked by metamaterials and their planar counterparts (i.e., metasurfaces) as an alternative to conventional antenna architectures. We will then delve into the information-encoding capabilities of these structures, which can transform how we store and process information. Finally, we will present the rather unusual characteristics of meta-inspired devices to realize unconventional responses, such as wave-chaotic surfaces for compressive computational imaging, their integration with AI for super-resolution, wireless power transfer, and beyond.