One of the challenges of researchers in the recent years is to find innovative concepts to bring superior properties of smart composite materials from the nano-level to macro-level. In this lecture a summary of updated knowledge on mechanical behavior of smart composite structures will be presented. This talk pay particular attention to the different length-scales (macro, micro and nano) as related to obtaining a deeper understanding of the vibration, bending, buckling and impact behavior of advanced materials. The presentation is organized around three areas: experimental studies, theoretical analyses and numerical modeling. I will try to cover our research group findings and observations related to the mechanical behavior of composites sandwich structures, SMA reinforced fiber metal laminates, coiled carbon nano tubes and piezoelectrically driven biosensor.