The term “fracture mechanics” refers to a vital specialization within solid mechanics in which the presence of cracks is assumed in a material, and the goal is to find quantitative relations between the crack length, the material’s inherent resistance to crack growth, and the stress at which the crack propagates at high speed to cause structural failure. This seminar will introduce fundamental concepts of fracture mechanics with particular emphasis on concrete and will also present some applications to the bond behavior of fiber reinforced polymers (FRP) externally applied to a concrete substrate. During the last two decades, FRP composites have been widely used for strengthening, repairing, and rehabilitation of reinforced concrete (RC) structural members. Debonding of the FRP composite reinforcement is the most critical concern in this type of application. Experimental results will be presented to point out how fracture mechanics is suitable to describe the FRP-concrete debonding mechanism and to foster a discussion on the design limits provided in the ACI 440.2R-08 guide document.

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