A cohesive zone model for delamination propagation in laminated composites under static and fatigue loading has been derived and validated with experimental data under different mode conditions. This study presents a new approach to quantify fatigue delamination degradation based on damage mechanics to evaluate the rate of fatigue damage (∂D/∂N∂D/∂N). The static damage evaluation and fatigue damage degradation are derived from damage surface concept. Both static and fatigue damage linked each other to establish fatigue crack growth formula in the laminated composites. A user-defined subroutine, UMAT, has been employed to develop and implement a damage model in ABAQUS. Two different specimens; a double cantilever beam and a single lap joint were used to investigate the effectiveness of the new method. The simulation results revealed that the developed model had good agreement with experimental data available in literature