We study gravitational waves from a binary system that is perturbed by the presence of a distant third body. We present three representative models of the hierarchical triple system and we numerically model the gravitational waveform. The motion of the bodies is simulated in the Newtonian approximation on a long timescale so that Lidov-Kozai oscillation can occur. This oscillation causes periodic exchange between relative inclination and eccentricity of the inner binary. We analyze the frequency spectrum of the waveform and identify the effect of perturbations on a timescale similar to the binary orbital period $T_{\rm in}$, perturbations related to the orbital period of the third body $T_{\rm out}$, and Lidov-Kozai cycles with an approximate period $T_{\rm out}^2/T_{\rm in}$. It is expected that the upcoming space detector LISA (Laser Interferometer Space Antenna) will be able to detect these gravitational signals and it will be possible to derive information about the triple system from the waveform.