We develop a linearly constrained bimatrix game framework that can be used to model many practical problems in many disciplines, including jamming in packetized wireless networks. In contrast to the widely used zero-sum framework, in bimatrix games it is no longer required that the sum of the players' utilities be zero or constant, thus, ir can be used to model a much larger class of jamming problems. Additionally, in contrast to the standard bimatrix games, in linearly constrained bimatrix games, the players' strategies must satisfy some linear constraint/inequality, consequently, not all strategies are feasible and the existence of the Nash equilibrium (NE) is not guaranteed anymore. We provide the necessary and sufficient conditions under which the existence of the Nash equilibrium is guaranteed, and show that under linear constraints, the equilibrium pairs and the Nash equilibrium solution of the constrained game corresponds to the global maximum of a quadratic program. Finally, we use our game theoretic framework to find the optimal transmission and jamming strategies for a typical wireless link under power limited jamming.