Decoding noninvasive EEG signals and extracting useful information are challenging because of its low signal-to-noise ratio. Therefore, signal processing techniques which incorporate additional information by formulating them as constraints are useful. This paper proposes a new framework to design the constraints and solve an optimization problem with the constraint. In this framework, we formulate a desired constraint in an adjacent matrix. We use the graph spectrum of the adjacent matrix as a constrained subspace in a parameter space. This framework can be easily applied to optimization problems which are formulated by a Reyleigh quotient. We evaluate the framework in optimization problems of smoothing spatial filters for multichannel EEG signals. The optimization problems are identical with principal component analysis and common spatial patterns which are formulated by the Reyleigh quotients. The spatial filters designed by the proposed method improve the performance for extracting source signals and classification accuracy in a brain machine interface.