A T junction in a photonic crystal waveguide is designed with the topology-optimization method. The gradient-based optimization tool is used to modify the material distribution in the junction area so that the power transmission in the output ports is maximized. To obtain high transmission in a large frequency range, we use an active-set strategy by using a number of target frequencies that are updated repeatedly in the optimization procedure. We apply a continuation method based on artificial damping to avoid undesired local maxima and also introduce artificial damping in a penalization scheme to avoid nondiscrete properties in the design domain.