Abstract: This thesis deals with solving singularly perturbed convection-diffusion equations. Firstly, we construct a matched asymptotic expansion of the solution of the singularly perturbed convection-diffusion equation in 1D and derive a formula for the zeroth-order asymptotic expansion in several two-dimensional polygonal domains. Further, we present a set of stabilization methods for solving singularly perturbed problems and prove the uniform convergence of the Il'in-Allen-Southwell scheme in 1D. Finally, we introduce a modification of the streamline upwind Petrov/Galerkin (SUPG) method on convection-oriented meshes. This new method enjoys several profitable properties such as the fulfilment of the discrete maximum principle. Besides the analysis of the method and derivation of a priori error estimates in respective energy norms we also carry out several numerical experiments verifying the theoretical results.