An accurate modeling of skin effect inside conductors is of capital importance to solve transmission line and scattering problems. This paper presents a surface-based formulation to model skin effect in conductors of arbitrary cross section, and compute the per-unit-length impedance of a multiconductor transmission line. The proposed formulation is based on the Dirichlet-Neumann operator that relates the longitudinal electric field to the tangential magnetic field on the boundary of a conductor. We demonstrate how the surface operator can be obtained through the contour integral method for the conductors of arbitrary shape. The proposed algorithm is simple to implement, efficient, and can handle arbitrary cross sections, which is the main advantage over the existing approach based on eigenfunctions, which is available only for canonical conductor's shapes. The versatility of the method is illustrated through a diverse set of examples, which includes transmission lines with trapezoidal, curved, and V-shaped conductors. Numerical results demonstrate the accuracy, versatility, and efficiency of the proposed technique.