Curve Integrals

Recall (or accept) from physics that the work (which has the same units as energy) done by a constant force F over a distance D is $W = FD$. This describes the case of the force pointing in the direction of motion. A slightly more general equation is $W = F \cdot D$, where F is the force vector and D is the displacement vector (imagine pushing a box). But this equation still assumes a straight-line displacement and constant force in a fixed direction. What if our trajectory is a curve $C(t)$ and the force is a vector quantity $F(X)$ that depends on position?