This thesis deals with the stochastic integral with respect to Gaussian processes, which can be expressed in the form $B_t = \int_0^t K(t,s)dWs$. Here W stands for a Brownian motion and K for a square integrable Volterra kernel. Such processes generalize fractional Brownian motion. Since these processes are not semimartingales, Itô calculus cannot be used and other methods must be employed to define the stochastic integral with respect to these proceses. Two ways are considered in this thesis. If both the integrand and the process B are regular enough, it is possible to define the integral in the pathwise sense as a generalization of Lebesgue-Stieltjes integral. The other method uses the methods of Malliavin calculus and defines the integral as an adjoint operator to the Malliavin derivative. As an application, the stochastic differential equation $dS_t = \mu S_t dt + \sigma S_t dB_t$, which is used to model price of a stock, is solved. Implications of such a model are briefly discussed.