

Abstract: In this Thesis we extend the classic theory of the Itô stochastic integral $(I) \int_0^T X dB$ on real line. We extend the Itô integral so that we can handle anticipating (non adapted) processes. We also introduce the integration with respect to the fractional Brownian motion B^H , $0 < H < 1$ which also covers the Itô integral, because the standard Brownian motion B coincides with $B^{\frac{1}{2}}$. Moreover it is well-known that the basic Itô integral is defined via L^2 procedures using Itô isometry which means that it cannot be defined pathwise. Contrary we introduce some concepts of pathwise stochastic integrals and compare them. In the last chapter we show the usage of the concept of generalized Perron (Kurzweil) integral for the stochastic integration.