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# Financial Engineering

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## Overview

The course aims to cover the basics in derivatives theory, and to apply them to a multitude of financial securities and structured products with a special emphasis on recent products in the derivative worlds. The course also looks at case studies to gain a better understanding of their practical usage. Implementation of the models numerically in Excel, VBA or Matlab is also covered.

## Key Contents

- Recapitulation of important Derivatives concept
  - FX Swaps, FRAs, Futures
  - Interest rate and cross currency swaps
  - Interest Rate swaps
  - Non-standard interest rate swaps
  - Cross currency swaps
  - Basic applications for swaps
  - Zero-coupon swap pricing
- Discount factors and the discount function
  - Relationship between zero, par, swap, and forward rates
  - Valuation and pricing of interest rate swaps
  - Valuation and pricing of currency swaps
  - Risk Management concepts
- Financial Options
  - Why options are different
  - Definitions
  - Options terminology
  - Understanding Greeks
  - Value and profit profiles at maturity
  - Pricing options
  - Black Scholes model
  - Binomial approach
  - Volatility
  - Value profiles prior to maturity
  - Behaviour of options
  - Hedging
- Applications for Financial Engineering
  - Applications of financial engineering
  - Sources of financial risk

- Accounting and economic risk
- Defining hedging objectives
- Measuring hedge efficiency
- Managing Currency Risk
  - Forwards and futures solutions
  - Comparing hedging strategies
  - Basic option hedges
  - Selling options within a hedging programme
  - Collars, range- forwards, forward-bands, cylinders
  - Corridors
  - Participating forwards
  - Ratio forwards
  - Break-forwards, FOXs, forward-reversing options
  - Using exotic options
  - Dynamic hedging
- Managing Interest-Rate Risk using FRAs, Futures and Swaps
  - Using FRAs
  - Using short-term interest rate futures
  - Calculating the hedge ratio
  - Stack vs strip hedges
  - Managing the convergence basis
  - Interpolated hedges
  - Combining the techniques
  - FRA vs futures
  - Using swaps
  - Hedging bond and swap portfolios
  - Hedging bond portfolios with bond futures
- Managing Interest-Rate Risk –Using Options and Option-Based Instruments
  - Interest rate guarantees
  - Using caps, floors, and collars
  - Collars, participating caps, corridors, and other variations
  - Using captions and swaptions
  - Comparison of interest risk management tools
- Managing Equity Risk
  - Bull and bear strategies
  - Return enhancements
  - Value protection strategies
  - Vertical, horizontal, and diagonal spreads
  - Using stock index futures and options
  - Portfolio insurance
  - Guaranteed equity funds
  - Warrants and convertibles
  - Exotic equity derivatives
- Commodity Risk
  - Commodity risk
  - Creating commodity derivatives
  - Using commodity derivatives
  - Hybrid commodity derivatives
- Structured Finance