COURSE DESCRIPTION

This is a graduate level, applications oriented course. Basic knowledge of finance, statistics and derivatives should, therefore, assumed. However, as I realize students have varied backgrounds, I structure the course to be self-contained. Hence I provide the class with the prerequisite fundamentals when necessary.

COURSE MATERIALS

I do not use a book. My lectures serve as the core material. There will be handouts on Blackboard. (Always consult Blackboard for important class announcements.) There are a number of good books available:

- McMillan, “Options as a Strategic Investment” provides investment and trading strategies.
- Hull, “Options, Futures and Other Derivatives” is analytical and concise.
- Natenberg, “Option Volatility & Pricing” is intuitive, analytical but it is not quantitative enough.
- Sinclair, “Options Trading” presents a nice mix, nut not structured as a textbook

CLASS ORGANIZATION & ADMINISTRATION

There will be three tests. There is also required homework.

My office hours are Wednesday 1:30 to 3:45 plus Tuesday and Thursday by appointment. Room 1158.
Quantitative Finance (22:839:609)

COURSE SCHEDULE

This list of topics is ambitious. We may not be able to cover all, as it depends on students’ backgrounds and preparations. I may also change the order of the presentation.

PART I – FUNDAMENTALS

- The vocabulary and jargon of options; the option contract
- Various option types and their parameters
- American, vs. European styles
- Exchange-traded vs. OTC; performance risk
- Explicit, embedded and implicit options
- Exotics
- Option payoffs
- Analytics of option value at expiration
- Basic option strategies
- Combinations
- Break evens and breakpoints
- Synthetics
- Spreads
- Digital options
- Options in M&A

PART II – REALTIONSHPIS, VALUATION AND TRADING

- Simple minimum and maximum values
- Fair forward pricing
- Spot vs. forward ATM
- Arbitrage, intrinsic and minimum values
- Put-call parity
- “Butterflies”
- Boxes
- Early exercise of Americans?
- Factors determining an option’s price, intuitively
- IV and TV over the option’s curve
- All the “Greeks”
- Hedge ratios; delta neutrality
- Crucial role of volatility
- “Gamma buyers” vs. “delta buyers”
- Convexity and gamma
- Dynamic hedging: what it costs the dealer to write options
- Buying and selling vol
- Historical vs. implied vs. realized vol
- Barrier options
- Asian-type payoffs
- Relation between binary and ordinary option
- Summary: risks and exposure of options positions

PART III – QUANTITATIVE PERSPECTIVES
- Fundamental dynamic relationship between underlying and derivative
- Black-Scholes result
- Binomial pricing model
- Measuring volatility
- Term structure of volatility
- Annualizing volatility
- Volatility “smile”
- GARCH
- Mean reversion
- Option spread trading

PART IV – APPLICATIONS TO FIXED INCOME AND OTHERS
- Convertible securities
- PIK bonds
- Duration of call option
- Callable bond; cancellable swap
- Swaps and swaptions
- Caps and floors
• Capped and inverse floaters
• Range notes
• Reverse convertibles
• Principal protected notes
• Sampling of structured products
• Accumulation products
• “Over/undervalued” FX via options
• Indirect volatility via FX correlations
• Yield curve via options
• Common stock as implicit option