



DEPARTMENT OF MATHEMATICAL SCIENCES

MMA711 Financial Derivatives and Partial Differential Equations, 7.5 higher education credits

Finansiella derivat och partiella differentialekvationer, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Mathematical Sciences on 2016-08-17 to be valid from 2016-09-01, autumn semester of 2016.

Field of education: Science 100%

Department: Department of Mathematical Sciences

Position in the educational system

The course can be part of the following programme: 1) Mathematical Sciences, Master's Programme (N2MAT)

Main field of studies

Mathematics

Specialization

A1F, Second cycle, has second-cycle course/s as entry requirements

Entry requirements

General entry requirements and the equivalent of the course *MMG810 Options and Mathematics* or in all 90 higher education credits in Mathematics and Mathematical statistics. The equivalent of the course *MSA350 Stochastic Calculus* is also required.

Learning outcomes

On successful completion of the course the student will be able to:

- master applications of martingale methods to option pricing
- explain risk-neutral pricing and market completeness

- derive the differential equation for the price of European derivatives when the underlying stock has stochastic volatility
- calibrate simple interest rate models
- compute numerically the price of European and American options

Course content

Concepts from stochastic calculus reviewed in the course:

- Brownian motion, Ito's calculus, stochastic differential equations
- Change of measure, Girsanov theorem

Topics in financial derivatives pricing theory include:

- Self-financing portfolio strategies and arbitrage
- Black-Scholes' model
- Stochastic volatility models and interest rate models
- Asian options
- Forwards and futures contracts
- Financial derivatives depending on multiple stocks

Connection with partial differential equations:

- Parabolic and hypoelliptic PDEs for option prices
- Initial and boundary value problems
- Numerical computation of option prices by finite difference and finite element methods.

Form of teaching

Language of instruction: English

Assessment

The examination consists of assignments and a written examination. Some of the assignments are based on Matlab.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

Course evaluation will be performed with a questionnaire and discussions with student representatives.

The results of and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.

Additional information

The course *MMA711 Financial Derivatives and Partial Differential Equations* has partially the same content as the course *MMA710 Financial Derivatives and Stochastic Analysis*. It is not allowed to be registered and/or examined in more than one of these courses.