

## COURSE INFORMATION SHEET FALL 2009

1. **Course:** APPLIED MATHEMATICS 481: Introduction to Mathematical Finance  
**Lecture/Time:** L01 MWF 10:00-10:50  
**Instructor:** Deniz Sezer  
**Office/Phone/Email:** MS 532 403 220 5092 adsezer@ucalgary.ca

2. **Prerequisites:** Math 323 and one of 353 or 351.

**NOTE: Students who do not have these pre-requisites can still take the course, but need to contact Dr. Joseph Ling to obtain a waiver. The instructor's minimal requirement for students to enroll in the course: MATH 253 or equivalent and MATH 211 or equivalent.**

**NOTE:** The Faculty of Science policy on pre- and co-requisite checking is outlined in the current University Calendar (see [www.ucalgary.ca/pubs/calendar](http://www.ucalgary.ca/pubs/calendar)) *Faculty of Science, section 5C*. **It is the students' responsibility to ensure that they have the pre- and co-requisites for the course, and if they do not they will be withdrawn from the course without notice.**

3. **Fee policy:** After the last day to drop/add courses (September 21), there will be no refund of tuition fees if a student withdraws from a course, courses or the session.

4. **Academic Accommodations:** It is the student's responsibility to request academic accommodations. A student with a documented disability who may require academic accommodation must register with the Disability Resource Centre to be eligible for formal academic accommodation. DRC registered students are required to discuss their needs with the instructor no later than fourteen (14) days after the start of this course.

5. **The University policy on grading and related matters** is described in the current University Calendar, *Academic Standings*. In determining the overall grade in the course, the following weights will be used:

<i>Assignments</i>	[ 5 ]	30%
<i>Midterm Test</i>	[ 1 ]	30 %
<i>Final Exam</i>		40 %

There will be a final examination scheduled by the Registrar's Office.

6. **Missed Components of Term Work.** The regulations of the Faculty of Science pertaining to this matter are outlined in the current University Calendar, *Faculty of Science, section 6A*. It is the student's responsibility to be familiar with these regulations.

7. **Academic misconduct** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the current University Calendar. See: <http://www.ucalgary.ca/honesty/>

8. **Dates and times of class exercises held outside of class hours (evening tests, Saturday laboratory examinations, weekend field trips, etc.):**

**\*\* THERE WILL BE NO OUT-OF-CLASS-TIME ACTIVITY. \*\***

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME ACTIVITY. If you have a conflict with any out of class time activity, please inform your instructor at least one week in advance of the activity so that other arrangements may be made for you.

9. **Course Description:** This course is an introduction to the fundamental concepts of mathematical finance in an elementary setting. Topics include: Risk, return, no arbitrage principle; basic financial derivatives: options, forwards and future contracts; risk free assets, time value of money, zero coupon bonds; risky assets, binomial tree model, fundamental theorem of asset pricing; portfolio management and capital asset pricing model; no-arbitrage pricing of financial derivatives; hedging; interest rate models.

10. **Textbook.** Marek Capinski and Tomasz Zastawniak *Mathematics for Finance: An introduction to Financial Engineering*, Springer-Verlag 2003.

11. **Syllabus:**

Introduction to basic notions assumptions: One period models. Definitions of portfolio and wealth. Assumptions of divisibility, liquidity, and short-selling. No arbitrage principle. Expected return and risk. (2 hours)

Basic financial derivatives: Forward contracts. Finding the forward price in a one-period model. Call and put options and their arbitrage free evaluation in a one-period model. Managing risk with options. (2 hours)

Risk free assets: Time value of money and interest rate. Periodic compounding. Continuous compounding. Streams of payments. Comparison of compounding methods. Zero coupon bonds and coupon bonds. Money market account (3 hours)

Risky assets: Multi step models. Computation of expected return. Binomial tree model. Risk neutral probability and martingale property. Continuous time limit. (3 hours)

Discrete time stock and money market models: Assumptions. Investment strategies. Fundamental Theorem of Asset Pricing. Applications to the binomial tree model. Extended market models with derivatives. (2 hours)

Portfolio management: Variance as a measure quantifying the risk of a portfolio. Computation of the minimum variance portfolio with and without shortsales. Efficient frontier. Capital asset pricing model . (4 hours)

Forward and futures contracts: Forward price of a stock with no dividends. Including dividends. Finding the value of a forward contract. Pricing of futures contracts. Hedging with futures. (4 hours)

Options: European options. Put-Call parity. American options. Bounds on option prices. Option prices as a function of strike price, maturity, and the price of the underlying stock. Pricing European options in the binomial tree model. Cox-Ross-Rubinstein formula. American Options in the Binomial tree model. Review of continuous time results. Black Scholes formula. (6 hours)

Hedging: Hedging options. Delta hedging. Greek parameters. Hedging business risk. Value at risk. Hedging with options and forward contracts. Speculating with derivatives. (6 hours)

Interest rate models: Variable interest rates and bond prices. Maturity independent yields. General term structure. Stochastic interest rates. Binomial tree model and arbitrage pricing of bonds. Interest rate derivative securities: options, swaps, caps and floors. (6 hours)