Course Description
This course is an introduction to the mathematical models used in finance and economics with particular emphasis on models for pricing financial instruments, or “derivatives.” The central topic will be options, culminating in the Black-Scholes formula and partial differential equation. The goal is to understand how the models derive from basic principles of economics, and to provide the necessary mathematical tools for their analysis. Basic stochastic calculus will be introduced. This course is not formally an actuarial exam prep class, but we’ll cover a substantial amount of material from the MFE exam.

Prerequisites
Math 233 and Stat 515

Textbook
- Typed Class Noted – Distributed in class.

Recommended books
- Derivative Markets, by Robert McDonald, 2nd or 3rd edition. This is the book recommended for those looking to take the MFE actuarial exam.
- Options, Futures, and Other Derivatives, by John Hull. This is another popular book written from the finance perspective.
- Stochastic Calculus for Finance I and II, by Steven Shreve. Much more advanced mathematically.

Calculator
Calculators are permitted on both homework and exams, although it is important that you show your work. It will be useful to have a calculator that can deal with standard normal variables. In particular it should have an ‘erf’ or ‘normaldc’ function. The TI-83 has this feature, but there are also a few cheaper scientific calculators that also seem to have it. If there is anyone who would like to use a table for these things, I can also provide that.

Grading
The following percentages will be used to calculate your grade.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Big Short quiz</td>
<td>5%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>30%</td>
</tr>
<tr>
<td>Final</td>
<td>35%</td>
</tr>
</tbody>
</table>
Written Homework
There will be weekly problem sets assigned. Your lowest homework grade will be dropped, but you are strongly encouraged to complete every assignment, since all of the material in this class is important. I will post solutions on the door of my office soon after they are due, and for this reason late homework will not be accepted.

The Big Short
There will be an open book, open notes quiz on the book “The Big Short” that will happen some time between the midterm and the final. I will assign chapters to read with the written homework to help you schedule.

Exam dates
There will be one evening exam, plus a comprehensive final.
   Exam       Wednesday, October 14 at 7-9pm (subject to change)
   Final      Monday, December 14 at 1:00–3:00

Tentative course outline
Week 1: Interest rates and time-value of money (Chapter 1.1-1.7)
Week 1: Basic overview on markets (Chapter 2)
Week 2/3: Introduction to options (Chapter 6)
Week 4: Review of discrete probability (Chapter 7)
Week 4/5: Pricing options with binomial trees (Chapter 8)
Week 6/7: A crash course in Stats 515–Continuous probability (Chapter 9). Review for midterm.
Week 7/8: Modeling the stock price and its volatility (chapter 10)
Week 9: Pricing options with expectations: deriving the Black-Scholes formula (chapter 10)
Week 10: Greeks (Chapter 11)
Week 11/12: Beyond Stats 515–Stochastic calculus (Chapter 12)
Week 13: Pricing options with dynamic hedging: deriving the Black-Scholes partial differential equation

Accommodation Statement: A student with a documented physical, psychological, or learning disability on file with Disability Services (DS) may be eligible for reasonable academic accommodations to help succeed in this course. If you have a documented disability that requires an accommodation, please notify the instructor within the first two weeks of the semester so that we may make appropriate arrangements.