Course Title: Applications of the Heat Equation for Financial Mathematics

Lecture: Tu/Th 2:30 PM - 3:45 PM Room N1022

Instructor: Dr. Boyan Kostadinov
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Website: http://websupport1.citytech.cuny.edu/faculty/bkostadinov/Site/MAT3788.html

Office Hours: MW 12:00PM-1:00PM or by appointment

Prerequisites: Probability, Calculus III and basic Numerical Computing

Software: MAPLE 13 and R for Statistical Computing are recommended

Text: Options, Futures and Other Derivatives by Hull, 6th or 7th edition

I am working on lecture notes that I will post on Blackboard.

I strongly encourage you to play with Wolfram Alpha. Look for the query box on my website.

Blackboard will be an essential component of this course where I’ll be posting lecture notes, homework assignments and all grades. Make sure you have a valid e-mail on Blackboard to be able to receive email announcements from me.


Grading Policy

Exam Average (40% of final grade): There will be 2 in class exams for 50 min on 5 problems. No make-up exams will be given, unless there is a legitimate reason.

Final Exam (20% of final grade): The final exam will take place during the last class of the semester and it will be comprehensive. There is no make-up final.
Quiz Av. (10% of final grade): There will be 2 quizzes for 30 min on 3 problems.

Project Presentation (10% of final grade): I will assign individual projects based on the covered material that will require a 10 min presentation.

Homework (15% of final grade): Homework will be assigned every lecture and will be collected for grading the following week. Homework will include actual Wall Street Finance Job Interview problems. Students may be required to present solutions to some hw problems on the board, at beginning of lecture.

Attendance and Participation, A&P (5% of final grade): Attendance is required and will be taken at the beginning of each class meeting. Active participation in class will be taken into consideration in computing the final grade.

All 6 categories that contribute towards the final grade are out of 100 points. The Final Score calculation is the weighted average of all 6 categories above:

Final Score = 0.4(Exam Av.) + 0.2(Final) + 0.1(Quiz Av.) + 0.1(Project) + 0.15(HW) + 0.05(A&P)

The grading scheme below should serve as a guideline for your Final Letter Grades based on the final score percentage obtained from the formula above:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<th>Grade</th>
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<tbody>
<tr>
<td>93 - 100 %</td>
<td>A</td>
<td>77 - 79.99 %</td>
<td>C+</td>
</tr>
<tr>
<td>90 - 92.99 %</td>
<td>A-</td>
<td>70 - 76.99 %</td>
<td>C</td>
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<tr>
<td>87 - 89.99 %</td>
<td>B+</td>
<td>60 - 69.99 %</td>
<td>D</td>
</tr>
<tr>
<td>83 - 86.99 %</td>
<td>B</td>
<td>0 - 59.99 %</td>
<td>F</td>
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<tr>
<td>80 - 82.99 %</td>
<td>B-</td>
<td></td>
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Extra help with course material: I strongly encourage you to come to my office hours for help, send me e-mails with questions or post your questions on the Blackboard Discussion Board where you can get answers from me or other students. I created on BB a forum called ‘Questions on Lecture Material, Exams and Homework’ where you can start posting questions on any topic of interest.
# Tentative Lecture Schedule and Topics based on the 6th edition

**Chapter 1**  
Day 1  Introduction. The Big Picture  
Day 2  Principals of Financial Valuation

**Chapter 4**  
Day 3  The Time Value of Money  
Day 4  Bond Pricing and Yield to Maturity  
Day 5  Duration and Convexity

**Chapters 2,5**  
Day 6  Valuation of Forwards and Futures  
Day 7  Forwards for Stocks with Dividends

**30 min Quiz**  
Day 8  Currency Forwards, Interest Rate Parity

**Chapter 8**  
Day 9  The Mechanics of Option Markets

**Chapter 9**  
Day 10  Calls, Puts and Put-Call Parity  
Day 11  Visualizing Option Payoffs

**Exam #1**  
Day 12  In class 50 min test on 5 problems

**Chapter 11**  
Day 13  One-step Binomial Model  
Day 14  Risk-Neutral Probabilities  
Day 15  Multi-step Binomial Trees  
Day 16  American Options and Dynamic Programming

**Chapter 12**  
Day 17  Brownian Motion with and without drift  
Day 18  Itō’s lemma and 2nd order Taylor’s Expansion

**30 min Quiz**  
Day 19  Geometric Brownian Motion and Simulations

**Chapter 13**  
Day 20  Black-Scholes-Merton PDE and No Arbitrage  
Day 21  Risk-Neutral Valuation and Martingale Pricing  
Day 22  Black-Scholes Pricing Formula

**Chapter 15**  
Day 23  Delta Hedging and the Greeks  
Day 24  Theta, Gamma and Vega as Risk Measures

**Exam #2**  
Day 25  In class 50 min test on 5 problems

**Chapter 18**  
Day 26  The VaR Risk Measure  
Day 27  Monte Carlo Simulations

**Presentations**  
Day 28  Individual Project Presentations

**Final Review**  
Day 29  Comprehensive Review

**Final Exam**  
Day 30  Final Exam on Thursday May 20th