

Financial Mathematics II (CRN: 17909)
Spring 2021
MATH 472.60/695.60 (3 credits), _Tu_ 2:00P–5:00P, Online

Prerequisite: A grades of C- or better in MATH 335 (*Mathematical Statistics I*) or MATH 333 (*Introduction to Probability and Statistics*) and MATH 372 (*Financial Mathematics I*) are the prerequisites for this course.

Instructor: Dr. Buchanan

Office: Wickersham 203-1, Phone: 871-7305, FAX: 871-7948

Office Hours: 12:30P–1:30P (MTuWThF), or by appointment

Email: Robert.Buchanan@millersville.edu (**preferred**)

Office hours will be held through Zoom videoconferencing. Students needing to connect with me during office hours should use the link:

<https://millersville.zoom.us/j/95440809855> Meeting ID: 954 4080 9855 Passcode: 453790

Textbooks: selected sections from two textbooks on finance and derivatives will be used.

- *Derivatives Markets*, 3rd edition, 2013, R.L. McDonald, Pearson Education, ISBN: 978-0-32154-308-0.
- *Corporate Finance*, 5th edition, 2020, J. Berk and P. DeMarzo, Pearson Education, ISBN: 978-0-13-518380-9.

Calculator: The Texas Instruments **BA II PLUS** calculator is approved for use on the actuarial exams. Students should practice solving problems using this calculator prior to taking the actuarial examination. Students may also use the Texas Instruments **BA II PLUS PROFESSIONAL** calculator.

There are calculator emulator applications for iOS and Android devices which may be used in class; however, only the actual calculator may be used on the official **SOA** Exam IFM.

Objectives: MATH 472.60 provides an introduction to the topics tested on the **Society of Actuaries** Exam IFM and **Casualty Actuarial Society** Exam 3. Upon completion of this course the student will understand:

- the assumptions of mean-variance portfolio theory and its principal results,
- different methods for the valuation of asset portfolios and explain their appropriateness in different situations,
- the notion of efficient markets and explain why market participants may make irrational systematic errors, leading to market inefficiencies,
- different ways to measure investment risk and conduct project analysis using advanced techniques used in capital budgeting,
- the factors that a company has to consider when deciding its capital structure,
- how forward contracts and futures contracts can be used in conjunction with the underlying asset in a risk management context,
- how call options and put options can be used in conjunction with the underlying asset in a risk management context,
- how binomial trees can be used to approximate the prices of both European and American call and put options on various underlying assets,
- how the Black-Scholes Formula can be used to form the prices of European call and put options on various underlying assets, and

- the importance of Option Greeks and risk management techniques in forming hedged asset portfolios that include positions in both options and the underlying asset.

Course Contents: Topics covered in this course will include the following from the textbooks.

- *Derivatives Markets*, 3rd edition, 2013, R.L. McDonald, Pearson Education, ISBN: 978-0-32154-308-0.
 - Chap. 1 Introduction to Derivatives, Sec. 1, 2, 4, 5
 - Chap. 2 An Introduction to Forwards and Options, Sec. 1–4
 - Chap. 3 Insurance, Collars, and Other Strategies, Sec. 1–4
 - Chap. 5 Financial Forwards and Futures, Sec. 1, 2, 3 (through the middle of p. 136), 4 (through the top of p. 143)
 - Chap. 9 Parity and Other Option Relationships, Sec. 1 (through the bottom of p. 269), 3
 - Chap. 10 Binomial Option Pricing: Basic Concepts, Sec. 1–5, 6 (through the middle of p. 315)
 - Chap. 11 Binomial Option Pricing: Selected Topics, Sec. 1
 - Chap. 12 The Black-Scholes Formula, Sec. 1–3, App. A, B
 - Chap. 13 Market-Making and Delta-Hedging, Sec. 1–4, 5 (beginning at the bottom of p. 398), 6
 - Chap. 14 Exotic Options: I, Sec. 1, 2 (through the bottom of p. 413), 3 (through the bottom of p. 416), 4 (through the bottom of p. 419), 5 (through Figure 14.4 on p. 423), 6, Exercises 14.20 and 14.21 on p. 429
 - Chap. 18 The Lognormal Distribution, Sec. 1–4, App. A, B.1, C
- *Corporate Finance*, 5th edition, 2020, J. Berk and P. DeMarzo, Pearson Education, ISBN: 978-0-13-518380-9.
 - Chap. 8 Fundamentals of Capital Budgeting, Sec. 5
 - Chap. 9 Valuing Stocks, Sec. 5
 - Chap. 10 Capital Markets and the pricing of Risk
 - Chap. 11 Optimal Portfolio Choice and the Capital Asset Pricing Model
 - Chap. 12 Estimating the Cost of Capital
 - Chap. 13 Investor Behavior and Capital Market Efficiency
 - Chap. 14 Capital Structure in a Perfect Market, Sec. 1–3
 - Chap. 15 Debt and Taxes, Sec. 1–2
 - Chap. 16 Financial Distress, Managerial Incentives, and Information
 - Chap. 22 Real Options, Sec. 1–4
 - Chap. 23 Raising Equity Capital, Sec. 1–3
 - Chap. 24 Debt Financing, Sec. 1–2

Since this course is intended to prepare students to pass SOA Exam IFM, class meetings will be divided into part presentation of mathematical and financial topics (lecture) and part solving exercises similar to those students will face on SOA Exam IFM (practice).

Attendance: This course will be conducted entirely online due to the COVID-19 pandemic. Class meetings (at the scheduled time of 2:00P–5:00P) will be conducted synchronously on Tuesdays through Zoom videoconferencing. During the synchronous class meetings I will present course content and conduct other class business requiring synchronous two-way communication with students. In order to effectively participate in class, students should have a computer with broadband internet access, a microphone, and preferably a webcam. Please use the recurring invitation:

<https://millersville.zoom.us/j/94903493032> Meeting ID: 949 0349 3032 Passcode: 910942

to join the videoconference. Zoom logs the participants who join the class meeting and the amount of time they were in the meeting. The class meetings will be recorded and the recordings posted to D2L in case students miss all or a portion of a synchronous class meeting. D2L also logs the content that students view and the length of time spent viewing each posted resource, therefore I will have a record of class attendance.

Students are expected to attend all synchronous class meetings. There is an inverse correlation between a student’s number of absences and final grade. This is due to the fact that daily contact with the material is essential to understanding the course contents. Getting the material second hand from someone else’s notes is simply not the same as hearing it for yourself. If you must be absent from class you are expected to complete class requirements (tests and/or homework assignments) prior to the absence. Students who miss a test should provide a valid excuse, otherwise you will not be allowed to make up the test. Tests should be made up within one week of their scheduled date. No final exam exemptions. Further information and details about this attendance policy can be found in the [University Approved Guidelines](#).

Homework: Students are expected to do their homework and participate in class. Students should expect to spend a minimum of three hours outside of class on homework and review for every hour spent in class. Homework exercises help students review and reinforce concepts covered in class. The textbook exercises are arranged in generally increasing level of difficulty. Working only the low-numbered exercises will not prepare a student sufficiently for the test and final examination exercises. All assigned homework exercises must be worked until successful completion. Each week students will receive a printed handout of homework exercises which must be completed and handed in at the beginning of the next class meeting for grading.

Tests: There will be a midterm and a final examination each of 120–180 minutes in length. The midterm will be given on Tuesday, March 9, 2021 and will cover all material seen to that point. The comprehensive final examination is scheduled for Friday, May 7, 2021 from 12:30P–2:30P. I will not “curve” test or exam grades. The format of the tests will mimic the format of SOA Exam IFM.

Grades: Course grade will be calculated as follows.

Homework	50%
Midterm Examination	25%
Final Examination	25%

I keep a record of students’ test, homework, and exam scores. Students should also keep a record of graded assignments, tests, and other materials.

The course letter grade will be assigned as follows. I will not “curve” course grades.

90-92	A–	93-100	A		
80-82	B–	83-86	B	87-89	B+
70-72	C–	73-76	C	77-79	C+
60-62	D–	63-66	D	67-69	D+
		0-59	F		

The last day to withdraw from a course (and receive the W grade) is Friday, April 5, 2021 at 11:59P.

Inclement Weather Policy: If we should miss a class day due to a school [delay](#) or [cancellation](#), any activities planned for that missed day will take place the next time the class meets. For example, if a test is scheduled for a day that class is canceled on account of snow, the test will be given the next time the class meets.

Cell Phones: Silence (or better yet, turn off) all cellular telephones upon entering the classroom. Leaving class to initiate or receive a telephone call will not be tolerated and students doing so will not be re-admitted to the classroom until the following class meeting. Texting or tweeting during class interferes with the learning process. Students distracted by their cell phones are not engaged in class and will find, over the course of the semester, that learning and course grade will suffer.

Title IX Reporting Responsibilities: Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, *et seq.*, and act in accordance with guidance from the Office for Civil Rights, the University requires faculty members to report to the University's Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report to the person designated in the University Protection of Minors policy incidents of sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred.

Information regarding the reporting of sexual violence, and the resources that are available to victims of sexual violence, is available at <https://www.millersville.edu/titleix>.

Final Word: Mathematics is not a spectator sport. What you learn from this course and your final grade depend mainly on the amount of work you put forth. Daily contact with the material through homework assignments and review of notes taken during lectures is extremely important. Organizing and conducting regular study sessions with other students in this class will help you to understand the material better.

No one can guarantee you success in this course. Your responsibilities and the instructor's expectation are outlined above. There will be no second chances, "do-overs", or extra credit assignments.