

Math 405 – Introduction to Financial Mathematics
Fall 2018
(3 Credit Hours; MWF 3:10pm-4:00pm)

Prerequisite: The prerequisite for the course is MATH 172 or MATH 182.

Instructor: Mark Lesperance

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Office Hours: MTW 11:00am-12:00pm or by appointment

Textbooks:

(Optional) Mathematics of Investment and Credit, 7th edition, by Samuel A. Broverman.

Calculator: Texas Instruments financial calculator BA-II Plus (or a TI graphing calculator with financial calculator functions. I think the TI-83 and later all have these). The BA-II Plus is required by the Society of Actuaries to take Exam FM/2

Description: This course provides an introduction to financial mathematics including the basics of annuities, stocks, bonds, and financial derivatives.

Core Areas: Critical and Creative Thinking; Quantitative Reasoning

Course objectives: This course is designed to teach students the fundamentals of the mathematical theory of interest with emphasis on how to perform valuations of annuities, stocks and bonds and derivatives markets. The course is meant to prepare students for the Financial Mathematics exam offered by the Society of Actuaries and the Casualty Actuarial Society. As this is a course on financial mathematics and requires students to analyze and interpret data, all of the objectives and outcomes relate to Critical and Creative Thinking and Quantitative Reasoning. These objectives will be tested through homework and exams.

Upon Completion of this course, students will:	Relevant Material	Evaluation Methods
Understand the fundamentals of the theory of interest including effective rates of interest, effective rates of discount, forces of interest and accumulation functions.	Week 1	Homework, Exams
Be able to provide valuations of annuities at various points in time.	Weeks 2-3	Homework, Exams
Be able to determine yield rates on an investment.	Week 4	Homework, Exams
Be able to find loan values using the Amortization method.	Week 5	Homework, Exams
Be able to determine the price, book value and market value of a bond.	Week 7	Homework, Exams
Be able to determine rates of return using the time-weighted and dollar weighted method.	Week 8	Homework, Exams
Be able to determine the value of a portfolio using swap rates and forward rates and determine if the investments are immunized	Weeks 9-10	Homework, Exams
Understand the relationships between forward contracts, call options and put options and how to combine these financial derivatives to investment strategies	Weeks 12-14	Homework, Exams

Homework will be given on a regular basis and will be similar to examples worked in class and previous Exam FM questions. The homework may include online assignments and printed assignments. The

number of points will vary by assignment. The points from all homework assignments will be combined and adjusted to a weight of 25% of your final grade. Late homework will be accepted if submitted within 10 days of the due date. A penalty of 2% per day will be applied to late homework (e.g. an assignment that is 3 days late will receive a 6% reduction for being late in addition to any points deducted for incorrect work. If an assignment is more than 10 days late, it will not be accepted. If there are extenuating circumstances, such as an extended illness, the instructor, at their discretion may choose to waive the penalty and accept the homework after the 10 day period. That decision will be made on a case-by-case basis.

Midterm Exams: Each midterm exam will cover material from 2-4 chapters of material. You will be allowed one sheet of notes (at most 8.5 in x 11 in.). Depending on the amount of material and difficulty level of the exam (*i.e.* reasonableness of completing the exam in the allotted time), we will have 2 midterm exams. Each midterm will have a 25% weight in the final grade. The problems will be similar to homework, examples and previous exam FM questions.

Final: The final will be comprehensive. The problems will be similar to homework, examples and previous exam FM questions. The final exam will have a weight of 25% in the final grade.

Make-up Exams: Make-up exams will be allowed on a case-by-case basis and will not be given to accommodate university conflicts, illness with a doctor's note or other verifiable unforeseen emergencies.

Class Participation/Attendance: In order to properly prepare for the actuarial exam and to gain a working knowledge of the material, attendance and participation in class are a necessity. While this will not be graded, you are highly encouraged to attend.

Grade Distribution:

Midterm Exams (2 @ 25% each)	50%
Final Exam	25%
Homework	25%
Total	100%

Evaluation Criteria: The grading scale for this course will be as follows:

A (93%-100%); A- (90%-92.99%); B+ (87%-89.99%); B (83%-86.99%)
B- (80%-82.99%); C+ (77%-79.99%); C (73%-76.99%); C- (70%-72.99%)
D+ (66%-69.99%); D (60%-65.99%); F(0%-59.99%)

Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

Statement Regarding Academic Integrity I encourage you to work with classmates on assignments. However, each student must turn in original work. No copying will be accepted. Students who violate WSU's Standards of Conduct for Students will receive an F as a final grade in this course, will not have the option to withdraw from the course and will be reported to the Office Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). It is strongly suggested that you read and understand these definitions:

Safety Statement: The Campus Safety Plan, which can be found at <http://safetyplan.wsu.edu>, and contains a comprehensive listing of university policies, procedures, statistics, and information relating to campus safety, emergency management, and the health and welfare of the campus community. Students should become familiar with the campus safety and emergency information provided at the safety plan web site and at <http://oem.wsu.edu/>. Everyone should also become familiar with the WSU ALERT site (<http://alert.wsu.edu/>) where information about emergencies and other issues affecting WSU will be found. Students should also go to the myWSU portal at <http://my.wsu.edu> and register their emergency contact information for the Crisis Communication System (CCS).

Statement Defining Expectations for Classroom Conduct: Respect each other and treat others how you want to be treated. Please silence your cell phones and all other electronics and refrain from using these items during class. It's only a 50 – minute class, the text can wait. Do not disrupt the class, students are

here to learn and cannot do so if others are being disruptive. If I feel you are disrupting the class or are disrespectful of anyone, I reserve the right to ask you to leave class for the day. Success in class requires reading the textbook, listening and asking questions in lectures, and doing all assigned work. Only you choose whether or not to succeed by doing these things.

Tentative Schedule of Events:

- Weeks 1: Interest Rate Measurement
 - Effective rates of interest, discount
 - Accumulation functions and force of interest
- Weeks 2-3: Valuation of Annuities
 - Level payment annuities
 - Deferred annuities and perpetuities
 - Annuities increasing/decreasing by a constant percentage
 - Annuities increasing/decreasing by a constant amount
 - Sinking funds
- Week 4: Yield rates, Net Present Value and Internal Rate of Return
- Week 5: Loan Repayment
 - Amortization schedules
 - Balance after the t^{th} payment, principal in the t^{th} payment, interest in the t^{th} payment
- Weeks 6: Mid-term 1
- Weeks 7: Bond/Stock Valuation
 - Bond pricing models
 - Yield rates for bonds
 - Callable bonds
 - Stock valuation
- Weeks 8: Rates of Return
 - Dollar-Weighted rates of return
 - Time-Weighted rates of return
 - Portfolio method
- Week 9: Term Structure of Interest Rates
 - Spot rates
 - Forward rates
 - Interest Rate Swaps
- Week 10: Mid-term 2
- Week 10: Cash Flow Duration and Immunization
 - Duration
 - Convexity
 - Immunization
- Week 11: Short Sales
- Weeks 12-14: Forwards, Futures, Swaps and Options
 - Forward Contracts
 - Call Options, Put Options and Synthetic Forward Contracts
 - Put-Call Parity
 - Investment and Hedging strategies
- Week 15: Review
- Week 16: Final Exam

Disclaimer: The schedule and procedures outlined in this syllabus are subject to change in the event of circumstances beyond the instructor's control or in response to ongoing assessment of learning.

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