Ma 361 ~ Theory of Interest

Fall Semester 2024 – 2025

Instructor:	Dr. Melissa Gardenghi
Office:	Alumni 38
Office Hours:	Daily by appointment, see https://calendly.com/mgardeng/20min
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Required Text:	*Mathematical Interest Theory*, 3rd Edition, ISBN 978-1-4704-6568-1 Access to Coaching Actuaries (see link in Teams)
Required Calculator:	**TI BA II Plus or Professional** (or TI 83/84, TI 89, TI-Nspire only with permission for non-Actuarial majors)
Course Website:	**http://math.bju.edu/ma361/**

Catalog Description:

Simple interest, internal rate of return, discount interest, discounted securities, compound interest, nominal and effective rates, force of interest, annuities, debt retirement methods, sinking funds, bonds, yield rate, stocks, depreciation, cash flow analysis for capital budgeting, depletion, capitalized cost, insurance, continuous steams, variable payments, adjusting for inflation, stochastic payments, default on loans, and stochastic interest.

Course Context: This course supports the following learning outcomes of the actuarial program:

- AS1: Solve problems using standard mathematical techniques.
- AS2: Progress logically from premises to valid conclusions in a variety of mathematical and applied contexts, including analysis, statistics (both theoretical and applied), probability and finance.
- AS3: Apply mathematics to actuarial problems (such as financial math and probability modeling) in exercising the biblical mandate to have dominion over the earth.
- AS4: Use technology as a tool for understanding as well as a labor-saving or problem-solving tool.
- AS5: Construct a biblically consistent philosophy of topics encountered in actuarial science.

Course Goals:

- CG1: Develop an understanding of the time value of money due to interest, including the development of a number of time value formulas. AS1 – AS3
- CG2: Develop competence in solving problems in the context of various financial transactions like amortized loans, bonds, long-term savings programs, or derivatives. AS1, AS3 – AS4
- CG3: Broaden the students' understanding of and experience with a variety of financial concepts that are applicable to personal finances and the field of business and finance. AS3
- CG4: Prepare the student for the SOA FM exam. AS3
- CG5: Align the student's thinking regarding money and its accumulation with scriptural principles. AS5

Course Objectives: The student will be able to*

1. understand the fundamental concepts of financial mathematics and their use, including the time value of money under simple and compound interest and discount, force of interest, and annuities with level and varying payments. CG1, CG4 (Assessed on Chs 1-4 tests and theory assignments)

2. apply the fundamental concepts in calculating present and accumulated values for various streams of cash flows. CG2, CG3, CG4 (Assessed on Chs 3-7 tests)
3. understand financial terminology for the time value of money and general cash flows. CG3, CG4 (Assessed on all tests)
4. evidence the ability to expand current knowledge without the aid of lecture. CG3, CG4 (Assessed by self-study project)
5. address professional development and worldview topics. CG1 (Assessed by the worldview assignment)
6. use the BA II Plus (or TI-89/TI-Nspire for non-Actuarial majors) to solve financial problems. CG4 (Assessed on all tests)
7. solve questions similar to those on Exam FM/2. CG4 (Assessed on chapter tests and final exam)

* Objectives are based on the Learning Outcomes stated in the syllabus for Exam FM/2.

Course Requirements and Evaluation: The course grade will consist of

1. Approximately four tests (three units and the Formulas) as announced in class. Each unit test will be worth approximately 150 points (the Formulas test will be worth 60 pts).**
2. Weekly homework rubrics – 7/8 points each, for 15 weeks. Recommended problems are posted on the course webpage. Additional SOA/test style problems are available in GOAL. There will be a weekly progress/homework report submitted (in Canvas – due by 11:59pm on Saturday of each week). Homework problems themselves will NOT be collected.
3. Approximately ten quizzes given through Coaching Actuaries – 5 points each.
4. Additional assignments worth varying amounts of points may be given throughout the semester.
5. Three papers/projects:
   - A reflection on professional/worldview development. (60 pts)
   - A self-study project interest rate swaps, forwards/options, and/or determinants of interest rates. (50 pts)
   - A theoretical project incorporating proofs of various relationships and formulas over chapters 1-6. (150 pts)
6. A cumulative final exam, worth approximately 250 points.

** Point assignments are subject to change.

Grading Scale: Standard 10 point scale

Office Hour Appointments:

Office hour appointments can be made using the Calendly site, https://calendly.com/mgardeng/20min (appointments may be made up to two weeks in advance). If there are no available times at which you able to meet, send Dr. Gardenghi a message including some days/times between 7:30am and 3pm when you are available.

General Policies:

Keeping current on all work is the best way to understand the material and hence get a good grade. Students who make up work after the fact often perform more poorly than students who keep up (and who often do well).

1. Compliance with student handbook policies is expected during class. The classroom is to be a professional environment. That means your attention is expected to be on course related material, and you are expected to positively contribute to the class.
2. Late Policy:
   - Weekly HW/progress reports are penalized at 25% per calendar day late (automatically in Canvas).
   - Coaching Actuary quizzes must be completed by the due date; no late work is available.
   - Written assignments/projects are penalized at 15% off if turned in within 3 calendar days of the due date, and are a 0 after that. Oral presentations are a 0% if not presented on the day assigned.

- In-class tests must be taken by the date given in class unless there is incapacitating illness and take-home portions must be submitted the day following the in-class test (see attendance policy below).
- Work may always be completed early (contact your professor if you wish to take a test early).

Exceptions may be granted by your professor in emergencies. Contact your professor asap by Teams to notify them of the emergency.

3. BJU attendance policy is in effect (see https://home.bju.edu/bju-policies/ for details).

Scheduled tests/quizzes should be taken before your planned absence; please contact your professor to make arrangements for doing so. You are personally responsible to get notes from your classmates and discuss the material missed with them. You should not expect your professor to privately re-teach you the material you missed. Your professor is always available to help you with specific questions. If an unannounced quiz/assessment is taken during the class that you miss, you will NOT be allowed to make it up, and you WILL receive a zero on the assignment. Work may always be completed early (see your professor if you wish to take a test early).

Missing a test because you feel you are not prepared to take it is **not** acceptable. Work missed for this reason will not be made up and you will receive a zero on the assignment.

For absences due to incapacitating illness or emergency, you should contact the instructor as soon as you realize you will not be in class to make arrangements for making up any missed work. Tests will be made up without penalty for the first occurrence. Each subsequent time a test is missed because of incapacitating illness or emergency, an additional 10 percent grade penalty for that test will be incurred.

4. University academic integrity policy is in effect (see https://home.bju.edu/bju-policies/ for more details).

Since the goal of the assignments in this course is to learn to develop the skills covered NOT complete the tasks assigned, and since the use of AI to complete or jumpstart tasks defeats the goal of the assignments, you may not use generative AI tools (i.e. Chat GPT, Bing Chat, Google Bard, etc.) in this course for any assignment without the professors express permission. Should an AI tool be used with permission, its use must be documented (including the tool used, a summary of the prompts provided and the portions of the assignment that were based on AI generated work).

Cheating is defined as any use of unauthorized helps, and plagiarism is defined as taking someone else's words and/or ideas and claiming them as your own.

Doing your own work brings glory to God. The claiming of someone else's work as your own is cheating and is a sin. All work done for this class needs to be your own. If information is taken from other sources (which is at times appropriate), it always needs to be referenced and credit given where it is due. Use standard referencing techniques as taught in En 102. Solutions found on the internet are not to be copied.

Projects: You are encouraged to discuss the general ideas as discussed in this course with your classmates but are not permitted to "work together" on your project. Your projects must represent your own ideas and your own work. The use of generative AI R code may be helpful at times. Consult with your professor before incorporating it into your work. If you do use it, you must document it as indicated above. You may NOT use AI to generate the text/discussion in any project.

Papers: You may discuss the general ideas included in your papers, but you must craft your own positions and the writing should represent your own work.

In-Class Tests: In today's age of technology, cheating includes getting unapproved help from a source on the internet and/or using your calculator to provide you with additional information during a test. The presence of any unauthorized material on your desk while taking a test will be construed as cheating and will be dealt

with as such. Cheating on a test may result in a zero on the test plus any penalties imposed by the Academic Integrity Committee.

Take-Home Tests: Take-home tests are also expected to represent your own work. All guidelines for in-class tests also apply to take-home tests unless explicitly stated otherwise in the directions. No collaboration, discussion, consultation, etc. with any person is permitted. Cheating on a test may result in a zero on the test plus any penalties imposed by the Academic Integrity Committee.

If you have a question about any source you are considering using, please gain your professor's advice/approval before using it. You are always permitted to ask your professor for help. Any help they choose to provide is acceptable.

Problem Presentation/Test Expectations:

1. Many of these problems will need a timeline diagram, especially after the first few sections of the text. The timeline should have dates and dollar values as well as the appropriate arrows to show what you are doing. Failure to include timelines when necessary on a test may result in a penalty. You will be learning about making timelines during class.

2. Clarity/neatness matters on your test presentations. Poor presentation of a correct solution may result in a penalty up to 10% of the points.

3. After the first unit, each test may contain at least one problem from prior units (i.e., each test to have a truly cumulative component).