

## Ma 308 ~ Theory of Interest

Fall Semester 2020 – 2021

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Instructor: Dr. Melissa Gardenghi  
Office: Alumni 38  
Office Hours: Daily 10:00 – 10:50 am by appointment; others by appointment  
Email: [mgardeng@bju.edu](mailto:mgardeng@bju.edu)  
Required Text: Guthrie & Lemon, *Math of Interest Rates and Finance*, 1<sup>st</sup> Edition, Prentice Hall  
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/ma308/>

### 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 streams, 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, annuities with level and varying payments, and applications of stochastics to payments and interest rates. CG1, CG4 (Assessed on Chs 1-5, 9 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 4-7, 9 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. present a Biblical philosophy on the use and accumulation of money. CG1 (Assessed by the philosophy paper)
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 – 6/7 points each, for 14 weeks. Recommended problems are posted on the course webpage. Released SOA exam problems will also be provided for practice. There will be a weekly progress/homework report submitted (in Canvas – due by end of day on Saturday of each week). Homework problems themselves will NOT be collected.
3. Additional assignments worth varying amounts of points may be given throughout the semester.
4. Three papers/projects:
  - o A philosophy paper on money. (25 pts)
  - o A self-study project covering yield curves, spot rates, and forward rates. (50 pts)
  - o A proofs project incorporating proofs of various relationships and formulas throughout the semester. (130 pts)
5. 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.

Instructions for using the site: <https://math.bju.edu/media/bju-math-division/bju-math-department/melissa-gardenghi/Office-Hours-Procedure.pdf>

A direct link to Calendly for making appointments with Dr. Gardenghi: <https://calendly.com/mgardeng/20min>

**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. BJU attendance policy is in effect (see <http://home.bju.edu/life/policies/class-attendance-policy.php> 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 missed material with them. You should not expect your professor to privately re-teach you the material you missed. 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.

3. University academic integrity policy is in effect (see <http://home.bju.edu/academics/> for more details).

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.

If you have a question about any source you are considering using, please gain your professor's 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, expect each test to contain at least one problem from prior units (i.e., expect each test to have a truly cumulative component).