Math 4250/5250 Theory of Interest

Description: General theories of interest, annuities, yield rates, amortization schedules, and sinking funds. Bonds and other securities and additional topics in financial analysis.

Prerequisite: MATH 2320 or consent of instructor.

Math 4250/5250 covers all of the topics of the interest theory portion of the actuarial exam FM/2 (Financial Mathematics) syllabus, comprising 65-80% of the material on exam FM. The most recent detailed syllabus and learning objectives for exam FM can be found at:

https://www.soa.org/education/exam-req/edu-exam-fm-detail.aspx

Note that the syllabus of Exam FM/2 is changing in Summer 2017. Those changes will be reflected in revised content in this syllabus.

In general, "Theory of Interest" refers to the time value of money and analysis of non-contingent cash flows, such as annuities, investments, bonds, and loans – basic financial mathematics. In contrast, contingent cash flows such as life insurance, life annuities, and pensions (life contingencies) are covered in MATH 4260-4270. A solid foundation in interest theory is essential for success in life contingencies.

Textbook: Broverman, S.A., *Mathematics of Investment and Credit* (Sixth Edition), 2016, ACTEX Publications. (This is a new edition for Fall, 2016. Do not buy the Fifth Edition.) ISBN 978-1-62542-485-3

The following chapters and sections to be covered are subject to minor changes depending on forthcoming changes in the actuarial examination syllabus for 2017 Exam FM.

- Chapter 1 excluding 1.2.1 and 1.8
- Chapter 2 excluding 2.4.2 and 2.4.3
- Chapter 3 excluding 3.2.1 and 3.2.2 and 3.4
- Chapter 4 excluding 4.3.2
- Chapter 5 excluding 5.1.4, the investment year method portion of 5.3.1, 5.3.2 and 5.3.3
- Chapter 6 excluding 6.2 and 6.4 [slides]
- Chapter 7 excluding 7.1.6 and 7.3
  *excluded is the part of 7.1.2 from the paragraph starting "Although" on page 369 to the end of that section, the part of 7.1.3 from the paragraph starting "It" on page 372 to the end of that section, and the last sentence of 7.1.5.
- Chapter 9 (9.1 only)

Every student should have the required textbook, which can be purchased from the campus bookstore or can be ordered from one of the actuarial bookstores e.g. actexmadriver.com or www.actuarialbookstore.com

Topics and problems from the SOA/CAS actuarial exam FM/2 (Financial Mathematics) will supplement the textbook.

Alternate textbook: Daniel, J.W., and Vaaler, L.J.F., *Mathematical Interest Theory* (Second Edition), 2009, The Mathematical Association of America, ISBN: 978-0883857540

Recommended Calculators:

- A basic scientific calculator will be fine in the beginning. For the actuarial exam FM/2 more than one calculator is recommended and permitted. The TI-30SX Multiview is probably the best of the approved scientific calculators. It is ideal for Exam P/1 and should also be valuable for Exam FM/2.
- Students can use a graphing calculator such as TI-84+ in this course, but a graphing calculator is not permitted on the SOA/CAS exams.
- For Exam FM/2, an approved financial calculator is also recommended. Texas Instruments BA II Plus (approved for the FM exam). This would not be used until mid-semester. It is used for problems where interest rate or time is unknown, bond or loan amortization, etc. For students who plan to take Exam FM/2 before graduation, an investment in one of the approved financial calculators may be advantageous, because it helps to practice problem solving with an approved calculator.
- The list of approved calculators for actuarial exams is here under "Exam Day Information": https://www.soa.org/education/exam-req/exam-day-info/edu-calculators.aspx

Alternate calculator options:

For students who do not expect to take the exam FM: learn to use the equation solver on a graphing calculator (this calculator is not permitted for exam FM but will be allowed for class exams.)

Notation and formulas: This subject introduces in part a standard system of notation used by actuaries, which continues in life contingencies. Many formulas are introduced and must be memorized in order to become expert at problem solving. Just as in calculus, it is important to learn a substantial set of formulas in order to be skilled and efficient in problem solving. Formula sheets are not allowed on exams.

Time lines: The textbook sometimes displays time lines (see e.g. page 5) to aid in the analysis of time value of money. The time line is an important tool in this subject and in life contingencies. However, because it is difficult to typeset, the time lines are not shown in many places in the text where they would be helpful. Learn to read the book with pencil and paper in hand and to sketch time lines for cash flows.

Homework:

- Assignments are subject to change and will be updated at least one week before the due date to reflect the class progress through the material. The list of assignments is provided as a guideline for course expectations.
- Some assignments may seem challenging and / or time consuming – be sure to allow sufficient time.
- The purpose of doing homework is to become skilled at solving problems quickly and correctly.
- Do not waste your time trying to get correct answers without understanding the problem.
- Homework is beneficial only if one reads the text rather than use it as a "look up" reference for formulas.
- After careful reading and understanding examples in the textbook, resist the habit of constantly looking up formulas in the book.
- It is a better strategy to collect essential formulas in a dedicated section of your notebook, where you can work towards seeing patterns and become comfortable with the notation.
- Whenever you need a formula, first make the attempt to write it down from memory, then check if you are not sure.

- Keep in mind: To pass Exam FM/2 one needs to be able to solve problems correctly at a rate of 5-6 minutes per problem.

Grading:

Homework: 33%
Midterm Exams and Quizzes: 33%
Final Exam   34%

The course grade will be determined by the percentage of total points earned:
90%-100% A, 80%-89% B, 70%-79% C, 60%-69% D, <60% F.

General Information and Resources for Students

The Learning Commons

The **Learning Commons** provides "one-stop-shop" academic support within the Jerome Library in the areas of Academic Coaching, Supplemental Instruction, Writing Consultations, Math/Stats Tutoring, subject groups and individual assistance.

The Learning Commons is a collaborative environment designed to foster independent learning to meet the needs of any student in any course at any time in the learning process. For more information, or to make an appointment: tlc@bgsu.edu ; 419-372-2823; www.bgsu.edu/learning-commons.html .

University Libraries

The University Libraries supports the teaching, learning and research mission of BGSU by advancing scholarship and creativity through collections and user-centered services that connect faculty and students to high quality information resources. For more information, to reserve a study space or to make an appointment: http://www.bgsu.edu/library.html ;http://www.bgsu.edu/library/ask-us.html ; 419-372-6943; libhelp@bgsu.edu.

Reserve Study Materials

- Study manuals for SOA/CAS Exam P/1 and Exam FM/2 are available on reserve at the Jerome Library.
- Please consider donating any unneeded study manuals/materials to the Mathematics Department to be placed on reserve at the library.

Academic Honesty Policy/Codes of Conduct

The instructor and students in this course will adhere to the University's general Codes of Conduct defined in the BGSU Student Handbook. The Code of Academic Conduct (Academic Honesty Policy) requires that students do not engage in academic dishonesty. For details, refer to the BGSU Codes of Conduct site at https://www.bgsu.edu/student-handbook/code-of-conduct.html.

The instructor and students will adhere to the general Code of Academic Conduct as outlined of the BGSU Student Handbook. Specifically, students will not cheat, fabricate, plagiarize or facilitate academic dishonesty. Students who passively engage in cheating (i.e. allowing others to cheat off of them) may receive the same consequences as the person copying. In group work, if your partner or teammates do all the work on an assignment, you should not be listed as a contributor and should receive no credit for that work. If you allow an assignment to be submitted listing you as a contributor, but you did not contribute, this is equivalent to plagiarism.

Classroom Expectations/Inclusion

Students are expected to display tolerance and respect in all communication. Comments and language should be respectful and appropriate for a college community. All comments should also follow acceptable grammar and spelling.

Disability Services

If you have a disability that I should be aware of, please notify me so that I can make arrangements to accommodate your learning needs. To get more information about your rights, contact the Office of Disability Services for Students located in 38 College Park, 419-372-8495. (http://www.bgsu.edu/disability-services.html)

Religious Holidays

It is the policy of the University to make every reasonable effort to allow students to observe their religious holidays without academic penalty. In such cases, it is the obligation of the student to provide the instructor with reasonable notice of the dates of religious holidays on which he or she will be absent. Absence from classes or examinations for religious reasons does not relieve the student of responsibility for completing required work missed. Following the necessary notification, the student should consult with the instructor to determine what appropriate alternative opportunity will be provided, allowing the student to fully complete his or her academic responsibilities. (As stated in The Academic Charter, B-II.G-4.b at:http://www.bgsu.edu/downloads/file919.pdf.

Technology Support

Provides a central point of contact for faculty, staff and students for questions, problem reports, service requests and inquiries for University computer systems and communications technologies at BGSU. Email: tsc@bgsu.edu Phone: (419) 372-0999.

Veterans

BGSU educators recognize student veterans' rights when entering and exiting the university system. If you are a student veteran, please communicate with your instructor so reasonable accommodations can be made for absence when drilling or being called to active duty. See (http://www.bgsu.edu/veteran/) for more information.