

The University of Iowa
College of Liberal Arts and Sciences
Fall - 23'

Course Information

Course: ACTS:3080:0001 Mathematics of Finance I

Time: 3:30 – 4:20 MWF

Classroom: 74 SH (In-Person)

Department: Dept. of Statistics and Actuarial Science - www.stat.uiowa.edu

Course Website: Iowa Courses Online (ICON); access using your Hawk ID and password.

Instructor and Grader Information

Name: Prof. Nariankadu *Shyamalkumar*

Office: 233 SH

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Office Hours: 1:00 – 2:00 MWF

Grader: Yan Shen

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Department Executive Officer

Name: Prof. Kung-Sik Chan

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Course Description and Objectives

This course introduces the financial math concepts underlying a fixed-income portfolio's valuation, design, and management. In particular, students learn to calculate values for various cash flow streams to use with reserving, valuation, pricing, asset/liability management, investment income, and capital budgets. *Prerequisite:* MATH:1860 Calculus II or equivalent.

This course is approved by the [SOA UEC](#) program for the SOA exam [Financial Mathematics \(FM\)](#). The objectives of this course coincide, for the most part, with the learning objectives of Exam FM.

Textbook & Calculators

Textbook: Vaaler, L.J.F., Harper, S.K., and Daniel, J.W. *Mathematical Interest Theory (Third Edition)*, 2019, The Mathematical Association of America, ISBN: 978-1-4704-4393-1:

We will cover the following sections from the text:

- Chapter 1 (excluding 1.13-1.16)
- Chapter 2 (excluding 2.6)
- Chapter 3 (excluding 3.10, 3.12, and the investment year method portion of 3.13)
- Chapter 4
- Chapter 5 (excluding 5.3)
- Chapter 6 (excluding sections 6.6-6.7, example 6.8.1 and section 6.10)
- Chapter 7 (excluding 7.2, 7.3, and 7.4)
- Chapter 8 (8.3 only)
- Chapter 9 (excluding 9.4, 9.5, and 9.7)

Table 1: Tentative Schedule

| Week | Topic | Sections |
|------|--|------------------|
| 1 | Time value of Money and Net Present Value | 1.1-1.7 |
| 2 | Nominal Rates of Interest and Force of Interest | 1.8-1.12 |
| 3 | Quiz 1; Equations of value and yield rates | 2.* (w/o 2.6) |
| 4 | Annuities Immediate and Due; Deferred Annuities | 3.1-3.6 |
| 5 | Quiz 2; Non-level annuities | 3.7-3.9, 3.11 |
| 6 | Annuities with different payment and conversion periods | 4.* |
| 7 | Quiz 3; Midterm; Review | - |
| 8 | Midterm; Amortization | 5.1 |
| 9 | Amortized loans with non-standard repayment; Replacement of Capital | 5.2,5.4 5.5 |
| 10 | Introduction to Bonds and its Valuation | 6.1-6.4 |
| 11 | Quiz 4; Bond Amortization, Callable Bonds, and Stocks | 6.5,6.8-6.9, 7.1 |
| 12 | Term Structure of Interest Rates | 8.3 |
| 13 | Duration and Convexity | 9.1-9.3 |
| 14 | Immunization | 9.6 |
| 15 | Review | - |

Calculator: We agree with the following statement from the [syllabus](#) for Exam FM - *Although several different calculators are allowed for this exam, the BAI Plus or Plus Professional are strongly recommended due to their ability to solve for interest rates. There may be examination problems that require the BAI Plus or Plus Professional in order to find the answer.* Also, you will be expected to have an SOA/CAS-approved calculator available during the exams. And calculators not approved by CAS/SOA will not be allowed.

Course Materials

This course will use the MS OneNote class notebook, which can be accessed via ICON or directly. Apart from class notes, other documents would be posted on the course website on ICON.

Evaluation

Class Attendance

Attendance is not mandatory. It must be said, though, that absentees who are frequently absent cannot expect the instructor to help them make up the missed material during office hours or by email.

Assignments - 20%

The assignments will mostly be given on Fridays and are expected to be turned in by the following Saturday at midnight. Assignments need to be scanned and uploaded on ICON so as to maintain a complete record of the grading, especially with this being a UEC course. Since I give an extra day of Saturday for submission, late assignments will **not** be accepted for any reason.

Biweekly Quizzes - 15%

Seven quizzes will be given - typically on Mondays - on 9/6, 9/18, 10/2, 10/23, 11/6, 11/17 (**Fri-day**), and 12/4. The lowest score will be dropped for grading purposes. Hence, missed quizzes will not be made up for any reason.

Midterm Exam- 25%

This is a closed-book 90-minute evening exam scheduled for 10/11/23 at 6:30-8:00 pm in 140 SH. The exam will consist of SOA Exam-FM-style questions but set as a written answer exam instead of as a multiple choice one.

Final Exam - 40%

This is a closed-book 2-hour exam consisting of SOA Exam-FM-style questions but set as a written answer exam instead of as a multiple choice one. It will be scheduled during the final exam week. The sample exam provided by the SOA, and available [here](#) is a good practice exam for the final in all senses, including both coverage and difficulty.

Missed Exams

Missed exams can be made up only for university-approved reasons, and unless the reason prohibits advanced notice, the student must provide the instructor with the required documentation with sufficient advance notice. In the case of illness, the student should inform the instructor by the end of the day of the exam unless the severity of the illness does not permit it.

Scoring for SOA UEC Credit

To determine the UEC credit, the final will comprise 80% of the UEC score, and the assignments will comprise the rest 20%. A minimum UEC score of 85% is required to obtain the UEC credit for SOA Exam FM.

Grade Scale for U of Iowa Course Final Grade

Final grades will be assigned according to the following tentative scale:

| | |
|----|----------|
| As | 85 – 100 |
| Bs | 70 – 84 |
| Cs | 55 – 69 |
| Ds | 40 – 54 |
| Fs | 0 – 39 |

The plus/minus grades will be used, and an A+ may be awarded to the top performer in the class who also contributes significantly to the in-class discussions. The exact scale will likely differ between undergraduate and graduate students, with the undergraduate scale resulting in an equal or higher letter grade for the same cumulative score.

Academic Honesty and Misconduct

All students in CLAS courses are expected to abide by the [CLAS Code of Academic Honesty](#). Undergraduate academic misconduct must be reported by instructors to CLAS according to [these procedures](#). Graduate academic misconduct must be reported to the Graduate College according to Section F of the [Graduate College Manual](#).

Student Complaints

Students with a complaint about a grade or a related matter should first discuss the situation with the instructor and/or the course supervisor (if applicable), and finally with the Director or Chair of the school, department, or program offering the course.

Undergraduate students should contact [CLAS Undergraduate Programs](#) for support when the matter is not resolved at the previous level. Graduate students should contact the CLAS [Associate Dean for Graduate Education and Outreach and Engagement](#) when additional support is needed.

Drop Deadline for this Course

You may drop an individual course before the deadline; after this deadline you will need collegiate approval. You can look up the [drop deadline for this course](#) here. When you drop a course, a “W” will appear on your transcript. The mark of “W” is a neutral mark that does not affect your GPA. Directions for adding or dropping a course and other registration changes can be found on the [Registrar's website](#). Undergraduate students can find policies on dropping CLAS courses [here](#). Graduate students should adhere to the [academic deadlines](#) and policies set by the Graduate College.

Date and Time of the Final Exam

The [final examination date and time](#) will be announced by the Registrar generally by the fifth week of classes and it will be announced on the course ICON site once it is known. **Do not plan your end of the semester travel plans until the final exam schedule is made public. It is your responsibility to know the date, time, and place of the final exam.** According to Registrar's final exam policy, students **have a maximum of two weeks after the announced final exam schedule** to request a change if an exam conflict exists or if a student has more than two exams in one day (see the [policy](#) here).

Attendance and Absences

Students with UI-authorized activities must discuss their absences with the instructor as soon as possible. Religious obligations must be communicated within the first three weeks of classes.

Communication: UI Email

Students are responsible for all official correspondences sent to their UI email address (uiowa.edu) and must use this address for any communication with instructors or staff in the UI community. For the privacy and the protection of student records, UI faculty and staff can only correspond with UI email addresses.

Mental Health Resources and Student Support

Students are encouraged to be mindful of their mental health and seek help as a preventive measure or if feeling overwhelmed and/or struggling to meet course expectations. Students are encouraged to talk to their instructor for assistance with specific class-related concerns. For additional support and counseling, students are encouraged to contact University Counseling Service (UCS). Information about UCS, including resources and how to schedule an appointment, can be found at counseling.uiowa.edu. Find out more about UI mental health services at mentalhealth.uiowa.edu.

[Student Care and Assistance](#) provides assistance to University of Iowa students who are experiencing a variety of crisis and emergency situations, including but not limited to medical issues, family emergencies, unexpected challenges, and sourcing basic needs such as food and shelter. More information on the resources related to basic needs can be found at basicneeds.uiowa.edu/resources/. Students are encouraged to contact Student Care & Assistance in the Office of the Dean of Students (Room 135 IMU, dos-assistance@uiowa.edu, or 319-335-1162) for support and assistance with resources.

University Policies

Accommodations for Students with Disabilities

The University is committed to providing an educational experience that is accessible to all. If a student has a diagnosed disability or other disabling condition that may impact the student's ability to complete the course requirements as stated in the syllabus, the student may seek accommodations through [Student Disability Services](#) (SDS). SDS is responsible for making Letters of Accommodation (LOA) available. **The student must provide an LOA to the instructor as early in the semester as possible, but requests not made at least two weeks prior to the scheduled activity for which an accommodation is sought may not be accommodated.** The LOA will specify what reasonable course accommodations the student is eligible for and those the instructor should provide. Additional information can be found on the [SDS website](#).

Free Speech and Expression

Absences for Religious Holy Days

Classroom Expectations

Non-discrimination

Sexual Harassment/Misconduct and Supportive Measures

Sharing of Class Recordings (if appropriate)