

University of Texas, Austin Course Syllabus
Department of Mathematics
ACF 329 (54830): Theory of Interest
Fall 2014

I. Course Title: ACF 329 Theory of Interest (Unique 54830)

II. Location, Days, and Time: RLM 5.118
MWF 1:00pm - 1:50pm

III. Faculty: Alisa Havens Walch, ACAS, MA
Lecturer of Mathematics
CAS Exams: 1-7, C1, C2, COP, VE, VF, VS

Office: RLM 13.148

Office Hours: MWF 9:30am - 10:15am
and MW 4:00pm - 4:30pm
Additional hours available by appointment, if you can not make the scheduled office hours.

Note: Students are expected to bring all class notes and the textbook with them to office hours.

E-mail: ahavens@math.utexas.edu (best way to communicate)

Telephone: (512) 232-6189 – UT (I never check the voice mail)

IV. Prerequisites: M 408D, M408L, or M408S with a grade of 'C-' or better.

V. Description of the Course: This course covers the mathematical theory of interest with applications to investments and corporate finance. The material is chosen to help prepare students that are taking the Financial Mathematics Exam, also referred to as Exam FM by the SOA (Society of Actuaries). See <http://www.soa.org/education/exam-reg/edu-exam-fm-detail.aspx> for more information on this exam.

In addition, this course carries the **Quantitative Reasoning Flag**. Quantitative Reasoning courses are designed to equip you with skills that are necessary for understanding the types of quantitative arguments you will regularly encounter in your adult and professional life. You should therefore expect a substantial portion of your grade to come from your use of quantitative skills to analyze real-world problems.

VI. Calculators: Any approved calculator can be used for this class (approved list: <http://www.soa.org/Education/Exam-Reg/Exam-Day-Info/edu-id-calculators.aspx>). Calculators not on this list will **not** be allowed on exams! It is recommended that you use the Texas Instruments BAII Plus or Texas Instruments BAII Plus Professional. The textbook gives detailed instructions on how to use these calculators, which can be advantageous. My personal favorite calculator is the Texas Instruments 30XS Multiview, but it does not have the same financial capabilities of the BAII's. If I was taking this class, I would use both.

VII. Learning Outcomes:

A. Time Value of Money

1. Define and recognize the definitions of the following terms:
 - a) Interest rate (rate of interest)
 - b) Simple interest
 - c) Compound interest
 - d) Accumulation function
 - e) Future value
 - f) Present value/net present value
 - g) Discount factor
 - h) Discount rate (rate of discount)
 - i) Convertible m-thly
 - j) Nominal rate
 - k) Effective rate
 - l) Inflation and real rate of interest
 - m) Force of interest
 - n) Equation of value
2. To be able to:
 - a) Given any two of interest rate, present value, or future value, calculate the third based on simple or compound interest.
 - b) Given any one of the effective interest rate, the nominal interest rate convertible m-thly, the effective discount rate, the nominal discount rate convertible m-thly, or the force of interest, calculate all of the other items.
 - c) Write the equation of value given a set of cash flows and an interest rate.

B. Annuities with payments that are not contingent

1. Define and recognize the definitions of the following terms:
 - a) Annuity-immediate
 - b) Annuity-due
 - c) Perpetuity
 - d) Payable m-thly, or Payable continuously
 - e) Level payment annuity
 - f) Arithmetic increasing/decreasing payment annuity
 - g) Geometric increasing/decreasing payment annuity
 - h) Term of annuity
2. To be able to:
 - a) Given an annuity with level payments, immediate (or due), payable m-thly (or payable continuously), and any three of present value, future value, interest rate, payment, and term calculate the remaining two items.
 - b) Given an annuity with non-level payments, immediate (or due), payable m-thly (or payable continuously), the pattern of payment amounts, and any three of present value, future value, interest rate, payment amounts, and term of annuity calculate the remaining two items.

C. Loans

1. Define and recognize the definitions of the following terms:
 - a) Principal
 - b) Interest
 - c) Term of loan
 - d) Outstanding balance
 - e) Final payment (drop payment, balloon payment)
 - f) Amortization
 - g) Sinking fund
2. To be able to:
 - a) Given any four of term of loan, interest rate, payment amount, payment period, principal, calculate the remaining items.
 - b) Calculate the outstanding balance at any point in time.
 - c) Calculate the amount of interest and principal repayment in a given payment.

- d) Given the quantities, except one, in a sinking fund arrangement calculate the missing quantity.

D. Bonds

1. Define and recognize the definitions of the following terms:
 - a) Price
 - b) Redemption value
 - c) Par Value/Face value
 - d) Coupon, Coupon rate
 - e) Term of bond
 - f) Yield rate
 - g) Callable/non-callable
 - h) Book value
 - i) Accumulation of discount/Amortization of premium
2. Given sufficient partial information about the items listed below, the candidate will be able to calculate any of the remaining items.
 - a) Price, book value, amortization of premium, accumulation of discount
 - b) Redemption value, face value
 - c) Yield rate
 - d) Coupon, coupon rate
 - e) Term of bond, point in time that a bond has a given book value, amortization of premium, or accumulation of discount

E. General Cash Flows and Portfolios

1. Define and recognize the definitions of the following terms:
 - a) Yield rate/rate of return
 - b) Dollar-weighted rate of return/Time-weighted rate of return
 - c) Current value
 - d) Duration (Macaulay, modified, and effective)
 - e) Convexity
 - f) Portfolio and investment year allocation methods
 - g) Spot rate
 - h) Forward rate
 - i) Yield curve
 - j) Stock price, stock dividend
2. To be able to:
 - a) Calculate the current value of a set of cash flows.
 - b) Calculate the portfolio yield rate.
 - c) Calculate the dollar-weighted and time-weighted rate of return.
 - d) Calculate the duration and convexity of a set of cash flows.
 - e) Calculate either Macaulay or modified duration given the other.
 - f) Use duration and convexity to approximate the change in present value due to a change in interest rate.
 - g) Calculate the price of a stock using the dividend discount model.

F. Immunization

1. Define and recognize the definitions of the following terms:
 - a) Cash-flow matching
 - b) Immunization (including full immunization)
 - c) Redington immunization
2. To be able to:
 - a) Construct an investment portfolio to fully immunize a set of liability cash flows.
 - b) Construct an investment portfolio to match present value and duration of a set of liability cash flows.
 - c) Construct an investment portfolio to exactly match a set of liability cash flows.

VIII. Instructional Materials:

A. Textbook: *Mathematical Interest Theory, Second Edition*, Vaaler & Daniel, Mathematical Association of America, ISBN 978-0-88385-754-0.

Sections we will try to cover:

For the most part, these sections will be covered in the order seen here.

Chapter 1 (1.2-1.12, 1.14)

Chapter 2 (2.2-2.7)

Chapter 3 (3.2-3.9, 3.11, 3.13)

Chapter 4 (4.2-4.6)

Chapter 5 (5.2-5.4)

Chapter 6 (6.2-6.6, 6.9)

Chapter 7 (7.1)

Chapter 8 (8.3)

Chapter 9 (9.1-9.5)

B. Other Study Materials: Study manuals, seminars, practice exams, and other tools are available at https://www.actuarialbookstore.com/order_selection.aspx. The Actuarial Science Club also has study manuals for members to borrow. These are optional and not necessary for this course, but are very useful if taking Exam FM/2.

Actuarial Outpost

This is a very useful discussion forum for current and aspiring actuaries. There are discussions for each exam, where current and former students can ask questions and give advice: <http://www.actuarialoutpost.com/>

C. Study Notes Available from the Societies: See <http://www.soa.org/education/exam-reg/edu-exam-fm-detail.aspx>. This link gives FM syllabus information, links to old exams, and links to videos for sample questions. On the FM syllabus are links to the sample questions and solutions without video. Also, on the FM syllabus are links that review some useful calculator functions for the BA-35 and BA II Plus.

IX. Instructor Specific Course Policies:

A. Make-Up Work: If you have prior knowledge that you will miss a scheduled exam or quiz, you must make alternative accommodations with me before missing the exam or quiz (typically taking the exam or quiz before it is scheduled). If you miss an exam for circumstances beyond your control and you do not know ahead of time that you'll be missing an exam, you must provide documentation in a timely manner that your absence was "legitimate" (e.g., a note from your doctor or your lawyer). You need to expect **at most one** opportunity to complete missed work. Also, if you miss an exam for any reason, you are not eligible to be exempt from the final.

It is the student's responsibility to obtain any notes missed in class. Do not ask me to re-present class content that was missed or ask to see my notes.

B. Cheating: Don't do it. Cheating is taken very seriously, especially in this class, considering that if you pursue being an actuary you will be taking exams for quite a while. The actuarial societies have no tolerance for cheating, and neither do I. If a student is caught in violation of the principles of academic honesty enforced at this

university, he/she is immediately reported to the higher authorities and assigned a failing grade in this course.

C. Classroom Distractions: The use of cell phones, tablets, and laptops is not permitted in class. Please make sure that cell phones, watch alarms, and anything else that makes noise do not disturb the class. Coming in to class late can be distracting. Please make every effort to be in class on time.

D. Extra Credit: You should not expect any extra credit for this class. In the unlikely event that extra credit is given, it will be made available to all of the students. Asking for extra credit lowers the probability that any will be given.

E. Professionalism: Students are expected to maintain appropriate behavior in the classroom, in office hours, and in any activities that reflect the actuarial program and university. Any unprofessional behavior in the classroom may result in the student being asked to leave the classroom.

X. University Policies and Services

A. UT Honor Code: The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.
<http://www.utexas.edu/about-ut/mission-core-purpose-honor-code>

B. Students with Disabilities: The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at (512) 471-6259, 471-4641 TTY.

C. Accommodations for Religious Holy Days: By University of Texas at Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

D. Nonacademic (family, health, etc.) Student Issues: Students should contact Assistant Dean Mike Raney, mraney@mail.utexas.edu, in the College of Natural Science Dean's Office or an academic advisor in RLM 4.101

E. Policy on Academic Dishonesty: Students who violate university rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failing in the course and/or dismissal from the University. For further information, visit the Student Judicial Services web site at www.utexas.edu/depts/dos/sjs.

F. Counseling and Mental Health Center: SSB 5th floor, (512) 471-3515
Hours: M-F 8:00am-5:00pm
24-Hour Telephone Counseling: (512) 471-2255
Behavior Concerns Advice Line (BCAL): (512) 232-5050

XI. Grading Policies

A. Homeworks: Homework assignments you turn in must be organized (solutions in order) and stapled in the top left-hand corner. They must be done carefully and written legibly on standard size paper with all perforated edges removed. Write only on the front of each sheet. Box or circle numerical answers where possible. Homework should be folded in half (hot-dog style) with your **Name, Course Number & Unique Number (ACF 329 - 54830), Assignment Number, and Date** on the outside. Each page should have your name and page number in the top right (Ex: Walch 1). Homework that is not prepared in this fashion may not be graded.

B. Quizzes: You can expect 4 quizzes throughout the semester: one before every in-term exam and one before the final. Additional quizzes may be administered at my discretion. No make-up quizzes will be given.

C. Classwork and Participation: This grade is affected by attendance, tardiness, attentiveness, participation in class discussions, working on assigned in-class problems, attitude, compliance with the syllabus, dishonesty, etc.

D. In-Term Exams: There will be three in-term exams administered during regular lecture time and will take place in the same classroom as lecture. Anybody who scores a 90% or above on all three in-term exams will not be required to take the final. The average score of all three exams will be used as the final exam grade for students not required to take the final. Note that this does not mean a student who is not required to take the final is guaranteed an A. In order to be eligible for exemption from the final, you **must** take all three in-term exams.

E. Final Exam: The final exam will be comprehensive, meaning any material covered in class or assigned as reading can appear.

F. Grade Distribution and Likely Exam Dates:

Note: These are likely exam dates and may change.

Homework	9%
Quizzes	9%
Classwork & Participation	5%
Exam #1 (September 26th)	18%
Exam #2 (October 24th)	18%
Exam #3 (November 24th)	18%
Final (December 10th 2pm-5pm)	23%

F. Rounding: Rounding is not guaranteed and is at my discretion.

G. Late Assignments: Late homework will not be accepted.

H. Letter Grade Ranges:

A:	[90%-100%]
B:	[80%-90%)
C:	[70%-80%)
D:	[60%-70%)
F:	[0%-60%)

Note: +/- grades are not assigned in this class.

XII. Drop Dates: The last drop date for this class is the one announced on the academic calendar for the University of Texas at Austin. See <http://registrar.utexas.edu/calendars>

XIII. Changes: This syllabus is subject to modification. Any changes will be announced in class.