

## **Math 418A      Financial Mathematics I**

### **Lind Hall 104, 2:00 – 2:50 (M,W,F)**

**Instructor:** Dr. Yvonne Chueh, ASA, MAA

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**Office Hours:** 10:00-10:50 Monday to Friday, or e-mail to make appointment or ask questions. Students can also catch me whenever my office door is open! Check out <http://www.cwu.edu/~chueh> for my current daily schedule.

**Prerequisite:** MATH 172.2 and Permission.

**Text:** Mathematics of Investment and Credit, 4<sup>th</sup> Edition, Samuel A. Broverman, Actex Academic Series

#### **Course Objectives:**

This course is required for Actuarial Science majors/specializations. As the first part of three-course sequence, it prepares students to pass SOA/CAS Exam FM. This exam is covered by the course sequence Math 418A,B,C (9 credits) followed by the new course Math 440 Financial Economics (5 credits). After completing the entire sequence, students will be able to calculate present and future values of annuities determined by interest rates. They will be able to apply methods of pricing investment products such as bonds and annuities as well as analyze loans and sinking funds. Students will also be able to solve interest-related problems in the actuarial professional. Students will gain understanding of financial derivatives (forwards, options, futures, swaps) and their use in risk management.

**In Math 418A, students will be able to calculate interest, present value, future value, annuity payment, annuity price, and time period required to accumulate the fund to a certain amount, as well as balance, principal and interest repayment in a loan.**

#### **Learning Objectives:**

1. Describe how to take into account the time value of money using the concepts of compound interest and discounting.
2. Show how interest rates or discount rates may be expressed in terms of different time periods.
3. Calculate the present value and the accumulated value of any annuity (a stream of equal or unequal payments) using specified rates of interest and the net present value at a real rate of interest, assuming a constant rate of inflation.
4. Define and use the compound interest functions.
5. Analyze compound interest problems.
6. Define Principal, Interest, Term of Loan, Outstanding Balance, Final Payment (drop

- payment, balloon payment), Amortization, Sinking Fund.
7. Given any four of term of loan, interest rate, payment amount, payment period, principal, calculate the remaining items.
  8. Calculate the outstanding balance at any time point during the loan period.
  9. Calculate the principal portion and interest portion of a given payment.
  10. Evaluate a sinking fund,

**Topical Outline:**

	<u>Topic from lecture notes handouts</u>	<u>Days</u>
I	Interest Rate Measurement	
	1. The accumulation and amount functions	
	2. The effective rate of interest	
	3. Simple interest	
	4. Compound interest	
	5. Present value	
	6. The effective rate of discount	
	7. Nominal rates of interest and discount	
	8. Forces of interest and discount	
	9. Varying interest	11
II	Valuation of Annuities	
	1. Annuity-immediate	
	2. Annuity-due	
	3. Annuity values on any date	
	4. Perpetuities	
	5. Unknown rate of interest	
	6. Varying interest	10
III	Loan Repayment	
	1. Loan balance	
	2. Amortization	
	3. Sinking fund	6
	TESTING	3
	TOTAL	30

## Class format

Lecture followed by in-class problem solving. For longer lecture explanations on advanced topics, students are expected to spend extra time on their own to seek and solve related problems. In-class problem-solving time is very limited and subject to students' learning progress. Instructor and students present their solutions of the assigned problems and answer questions raised by the instructor and the class. Class pace may be affected by student in-class participation, preliminary reading, and constant review. This is a very fast-paced class but it will somewhat be adjusted by the instructor according to student feedback during the course.

## Attendance

To achieve success in *any* mathematics class, **regular attendance is almost imperative**. Unlike most subjects, new topics in Financial Mathematics build on previous knowledge; failure to learn something early may haunt you throughout the course. We will do work in class occasionally, so if you missed a class you missed in-class credit.

**IF YOU MISS CLASS, IT IS YOUR RESPONSIBILITY TO FIND OUT THE MATERIAL COVERED, ANNOUNCED, OR ASSIGNED, AND TO ARRANGE TO PICK UP ANY ASSIGNMENTS THAT MAY BE HANDED OUT OR RETURNED!**

## Homework

Homework will be assigned in class and the due date will be announced. Working on homework is the only way most of us learn to critically analyze and “solve” problems.

Some class time will be devoted to questions on the homework. Office hours are also scheduled to provide opportunities for more in-depth discussion of homework problems.

## Grading policy

- Assignments and in-class problem solving (100 points)
- Three Learning Experience (300 points)

Total                    400 points

**Tentative Schedule** (Any change will be announced in class.)

**Week**

**Reading Assignment**

0. 9/22-9/24	1.1-1.2
1. 9/27-10/1	1.3-1.4
2. 10/4-10/8	1.5-1.6
3. 10/11-10/15	1.7; Review
4. 10/18-10/22	<b>Learning Experience I.</b> 2.1
5. 10/25-10/29	2.2
6. 11/1-11/5	2.3
7. 11/8-11/12	2.4; Review
8. 11/15-11/19	<b>Learning Experience II.</b> 3.1
9. 11/22- 11/26	3.2 <i>THANKSGIVING!!</i>
10. 11/29-12/03	3.3; Review
11. 12/06-12/10	<b>Learning Experience III .</b>

**Note: Due to the long list of topics to cover, the Learning Experience III will occur during the final's week. The content covered will be announced.**