Math 370 – Financial Mathematics (3)

Course Description: Interest rate measurement, valuation of annuities, loan repayment, bond valuation, rate of return. Term structure of interest rates, cashflow duration and immunization. Financial mathematics actuarial exam topics.
Prerequisites: MATH 216 or MATH 242 or MATH 252A, or both MATH 203 and BUS 250.

Course Format: The class meets three times a week for 50 minutes.

Possible texts:
Samuel A. Broverman, Mathematics of Investment and Credit.

Topics:

Weeks 1–4:

1. Section 1.1: Interest Accumulation and Effective Rates of Interest.
2. Section 1.2: Present Value.
3. Section 1.3: Equation of Value.
4. Section 1.4: Nominal Rates of Interest.
5. Section 1.5: Effective and Nominal Rates of Discount.
6. Section 1.6: The Force of Interest.
7. Section 1.7: Inflation and the Real Rate of Interest.
8. Midterm Exam 1

Weeks 5–8:

1. Section 2.1.1: Accumulated Value of an Annuity.
2. Section 2.1.2: Present Value of an Annuity.
3. Section 2.1.3: Annuity-Immediate and Annuity-Due.
4. Section 2.2: Level Payment Annuities
5. Section 2.3.1: Annuities whose payments form a geometric progression
6. Section 2.3.2: Annuities whose payments form an arithmetic progression
7. Section 2.4: Applications and Illustrations of Valuation of Annuities
8. Section 3.1: The amortization method of loan repayment
9. Midterm Exam 2

Weeks 9–12:

1. Section 3.2: Amortization of a loan with level payments
2. Section 3.3: The sinking-fund method of loan repayment
3. Section 3.4: Applications and illustrations of loan repayment
4. Section 4.1 Determination of bond prices
5. Section 4.2: Amortization of a bond
6. Section 5.1: Internal rate of return and net present value
7. Section 5.2 Dollar-weighted and time-weighted rate of return
8. Midterm Exam 3

Weeks 13–15:

1. Section 6.1: Spot Rates of Interest
2. Section 6.3: Forward rates of interest
3. Section 7.1: Duration of a set of cashflows and bond duration
4. Section 7.2: Asset-liability matching and immunization
5. Section 7.3: Applications and illustrations of cashflow duration and immunization
**Course Objectives and Student Learning Outcomes:** Upon successful completion of Math 370, the student will be able to solve problems arising on the FM (Financial Mathematics) actuarial exams, and solve real world problems involving loan amortization, repayment, etc.

**Program Objectives:** The successful student will acquire the skills prerequisite to taking Financial Mathematics exams of the Society of Actuaries and Casualty Actuarial Society. Together with Math 471–472 preparing them for Exam P (probability) the course will give students a solid start on an actuarial career.