STAT 451/BEPP 451/STAT 851/BEPP 851
Fundamentals of Actuarial Science I
Fall 2019

Textbooks: Broverman: Mathematics of Investment and Credit, 7th ed. (Bookstore)
Dickson, Hardy, Waters: Actuarial Mathematics for Life Contingent
Risks (Bookstore)

Course Pack: www.study.net. Password: INSR2010

Office hours: Tuesdays and Thursdays, 1:00-2:45, and by appointment, JMHH 458
(lemaire@wharton.upenn.edu)

Note: If you hit "**Reply**" on an e-mail from me to the class, you are replying
to the whole class.

Homework: Homework problems, to be found in the course pack, are to be turned in
four times during the course.

Lesson 1:   Introduction to the actuarial science program
8/27

Lesson 2:   The measurement of interest: interest accumulation and effective
8/29   interest rates (Broverman 1.1).
Present value (1.2). Equation of value (1.3)

Lesson 3:   Nominal rates of interest (1.4). Effective and nominal rates of
9/3   discount (1.5)

Lesson 4:   The force of interest (1.6). Inflation (1.7)
9/5

Lesson 5:   Level payment annuities (2.1)
9/10

Lesson 6:   Some generalizations (2.2)
9/12

Lesson 7:   Annuities with non-constant payments (2.3)
9/17

Lesson 8:   Loan repayment: Amortization method (3.1, 3.2)
9/19   **Homework due: K1-1, K1-3, K1-11, K1-12 K3-3, K3-11, K3-15, K3-20**

Lesson 9:   Truth in Lending (3.2.2)
9/24

Lesson 10:   The Sinking Fund method. Applications (3.3)
9/26

Lesson 11:   Applications (3.3)
10/1   **End of mid-term material**

Lesson 12:   Bonds pricing (4.1)
10/3   **Homework due: K5-2, K6-1, K6-5, K6-6**

10/8 class cancelled

Lesson 13:   **Mid-term exam**
10/15

Lesson 14:   Bond amortization (4.2). Callable bonds (4.3)
10/17

Lesson 15:   Internal rate of return (2.4.1, 5.1)
10/22   Dollar-weighted and time weighted rate of return (5.2)

Lesson 16:   Spot rates (6.1), forward rates (6.3), swaps (8)
10/24

Lesson 17:   Duration, Immunization (7.2)
10/29

Lesson 18:   Survival Models (Dickson chapter 2)
10/31

Lesson 19:   Survival models (2)
11/5

Lesson 20:   Life tables (3)
11/7

Lesson 21:   Assumptions for fractional ages (3)
11/12

Lesson 22:   Select tables (3)
11/14

Lesson 23:   Whole life insurance (4)
11/19   **Homework due: B3-1-3, B3-1-4, B3-3-6, B3-4-3**
              Check remark below about the use of tables

Lesson 24:   Whole life insurance (4)
11/21

Lesson 25:   Term insurance (4)
11/26

Lesson 26   Other life insurance policies (4)
12/3   **Homework due: B4-2, B4-3, B4-6, B4-10**

Lesson 27   Application: Guns and life expectancies
12/5   The paper is in the course pack under "Journal of Risk and Insurance"

Final Exam:

Homework is individual work. Homework questions are found in the course pack (not textbook exercises). You are not to discuss homework with other students. Some homework questions require the use of an Illustrative Life Table. Two such tables are provided in the course pack: an "old" table (i=5%), for all problems that begin with the letter B, and a "new" table (i=6%), for problems downloaded from the Society of Actuaries' web site.

You need to bring a calculator (SoA recommended calculator TI BA II PLUS or equivalent) to the mid-term and final exam. You are not expected to know financial functions on the calculator. You may bring your class notes, the textbooks, and a few pages of hand-written formulas. The final is as non-cumulative as possible. Final grade: 20% homework, 40% mid-term, 40% final

The material for the mid-term and the final exam is the material taught in class, not the material of SoA exams. Material covered in class that is not part of SoA exam FM mostly consists of Truth-in-Lending and applications.

Answers to course pack questions dated 2000 and later can be found in the SoA website: www.soa.org (click: Education and exams, past exams and solutions). A grid with answers to earlier questions is in the course pack. A sample mid-term and a sample final are in the course pack under the title "Mid-term exam 2004-2005".

Study notes:

http://www.soa.org/Files/Edu/2017/fm-duration-convexity-present-value.pdf

http://www.soa.org/Files/Edu/2017/fm-interest-rate-swaps.pdf

http://www.soa.org/Files/Edu/2017/fm-determinants-interest-rates.pdf

TI BA II PLUS calculator functions: http://www.soa.org/files/pdf/FM-23-05.pdf