

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS & STATISTICS
DHAHRAN, SAUDI ARABIA

AS 201: Financial Mathematics
Term 201 – Fall 2020

Instructor: Ali Nabi Duman
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Office Hours: UTR 12:10 PM – 01:00 PM or by appointment

Time: UTR 11:00 AM – 11:50 AM
Place: Microsoft Teams otherwise Building 3 – Room 100

Prerequisite: Math 102
Credit Hours: (3-0-3)

Course Description:

Theory of compound interest and the mathematics of investment and credit. Measurement of interest, annuities certain (level, non-level, and continuous), amortization schedules, sinking funds, investment yield rates, and valuation of bonds and other securities. Methods of loan measurement and payments (Islamic and Conventional) are illustrated in amortization and sinking fund schedules. Islamic views on interest and investments.

Course Material:

1. Course Syllabus: Posted on Blackboard.
2. Textbook: Broverman, S.A., Mathematics of Investment and Credit (Fifth Edition), 2010, ACTEX Publications, ISBN 978-1-56698-767-7.
3. Notes: Class Notes.
4. Calculator: Texas BA II Plus Calculator or Texas BA II Professional.
5. Reference 1: Daniel, J.W., and Vaaler, L.J.F., Mathematical Interest Theory (Second Edition), 2009, The Mathematical Association of America, ISBN: 978-0883857540.
6. Reference 2: Kellison, S.G., The Theory of Interest (Third Edition), 2009, Irwin/McGraw-Hill, ISBN: 125921544X or 978-1259215445.

Attendance:

The student is responsible for all material presented in class. Some of the material presented in class might not be in the textbook. Generally, attendance will be checked at the beginning. The students has to be available until the end of the class. Entering the class after that, is considered as late. Unexcused late/absence cases might be penalized by grade deductions as announced by the instructor. Excessive unexcused absences will result in a grade of DN in accordance with University rules.

Communication:

For regular announcements, students are advised to check Blackboard regularly.

Grading:

Your course grade will be based on the total of points accumulated on class work two major exams, and Final Exam. The following scale gives the cut-off points for the course grades.

| | | | | | | | | | | |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|------|--------------|
| Letter grade | A+ | A | B+ | B | C+ | C | D+ | D | F | DN |
| Cut-off | 90% | 85% | 80% | 75% | 67% | 60% | 55% | 50% | <50% | ≥ 9 absences |

| Activity | Weight |
|--------------------------------|--------|
| 3 Online Assessments | 3×15% |
| Midterm | 15% |
| Classwork (Quizzes+Attendance) | 15% |
| Final Exam (Comprehensive) | 25% |

Missing Exam I or II:

No makeup exam will be given under any circumstance.

General Comments:

- It is essential that you keep up with the material as it is presented. This, unfortunately, is not one of those courses where it is possible to catch up the last minute. In particular, it is important to do the problems as the material is presented.
- I encourage you to discuss the assigned problems with other students and work on them in groups. Discussing the assigned problems with others will also help you explain them clearly in the quizzes or exams.
- Bonus points might be awarded for showing alertness and participation in class discussions.
- The schedule is tentative and might be adjusted based on the progress of the class.
- To successfully prepare for the SOA exams, students MUST solve problems regularly. The selected assigned problems are specifically designed to prepare you for major and final exams, and SOA Exam FM. So, it is expected that you complete these problems step-by-step and with comprehension.
- For every exam, you need to bring with you *pens, pencils, a sharpener, an eraser, and a SOA approved calculator.*

Student Learning Outcomes:

<https://www.soa.org/education/exam-req/edu-exam-fm-detail.aspx>

Academic Integrity:

All KFUPM policies regarding **ethics** and **academic honesty** apply to this course.

| Week | Date | Section | Topics | Important Dates |
|--------------------------|---|--------------------------------|---|---|
| 1 | Aug 30 th – Sept 3 rd | Chapter 1 1.1 1.2 | Interest rate Measurement Interest Accumulation and Effective Rates of Interest Present Value (excluding 1.2.1) | |
| 2 | Sep 6 th – Sep 10 th | 1.3 1.4 1.5 | Equation of Value Nominal rates of Interest Effective and Nominal Rates of Discount | |
| 3 | Sep 13 th – Sep 17 th | 1.6 1.7 2.1 | The force of Interest Inflation and the “Real” rate of Interest Level Payment Annuities | |
| 4 | Sep 20 th – Sep 22 th | Chapter 2 2.1 Cont. 2.2 | Valuation of Annuities Level Payment Annuities Level payment Annuities – Some Generalizations | Sep 23-24: National Day Holidays Assessment 1 |
| 5 | Sep 27 th - Oct 1 st | 2.3 2.4 | Annuities with Non-Constant payment Applications and Illustrations (excluding 2.4.2 & 2.4.3) | |
| 6 | Oct 4 th - Oct 8 th | Chapter 3 3.1 3.2 3.3 | Loan Repayment The amortization model of Loan Repayment Amortization of a Loan with Level Payments (excluding 3.2.1 & 3.2.2) The sinking Fund Method of Loan Repayment | |
| 7 | Oct 11 th – Oct 15 th | Chapter 4 4.1 4.2 4.3 | Bond Valuation Determination of Bond Prices Amortization of a Bond Applications and Illustrations (excluding 4.3.2) | Midterm |
| 8 | Oct 18 th – Oct 22 st | Chapter 5 5.1 5.2 5.3 | Measuring the Rate of Return of an Investment Internal Rate of Return defined and Net Present Value (excluding 5.1.4) Dollar-weighted and Time-Weighted Rate of return Applications and Illustrations (excluding the investment year portion of 5.3.1, 5.3.2 & 5.3.3) | |
| 9 | Oct 25 th – Oct 29 th | Chapter 6 6.1 6.3 | The term structure of interest rates Spot Rates of Interest Forward rates of Interest | |
| 10 | Nov 1 st – Nov 5 th | Chapter 7 7.1 | Cash flow duration and Immunization Duration of a set of Cash flows and Bond duration (excluding 7.1.6) | Assessment 3 |
| 11 | Nov 8 th – Nov 12 th | 7.2 Chapter 8 8.1 | Asset-liability Matching and Immunization Additional Topics in Finance and Investment. The dividend discount model of stock valuation | |
| 12 | Nov 15 th – Nov 19 th | SOA Exam FM Note | Using Duration and Convexity to approximate change in present value. | |
| 13 | Nov 22 th – Nov 26 th | SOA Exam FM Note | Interest Rate Swaps | Assessment 4 |
| 14 | Nov 29 th – Dec 3 rd | SOA Exam FM Note | Determinants of Interest rates | |
| 15 | Dec 6 th – Dec 10 th | SOA previous Exams | Review \ Exam FM Practice Problems | |
| Final Examination | | | | |