

Syllabus
AQM1051E Fundamentals of Financial Mathematics
Luis Chavez-Bedoya, PhD
Summer semester 2024

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|----------------------|-------------------------|---------------------------|
| Level | Bachelor | |
| Credits | 2 | |
| SWS | 2 | |
| Workload | 60 hours | |
| Prerequisites | None | |
| Time | See LSF | |
| Room | See LSF | |
| Start date | See LSF | |
| Lecturer | Name | Luis Chavez-Bedoya |
| | Office | (external lecturer) |
| | Virtual office | See LSF |
| | Colloquium | See LSF |
| | Phone | - - - |
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Summary

The lecture starts out with an introduction into the mathematical foundations necessary for the application of financial-mathematical methods. For that matter, exponential and logarithmic calculations as well as the handling of sums, series and sequences will be practiced. The core of the lecture is formed by the classical methods of financial mathematics, i.e. the computation of interest, capital budgeting, pension and amortization calculations, and interest instruments and derivatives. Here, a special focus will be put on the practical application in one's private life, as well as in a company's normal routine. In the prospects, there will be an introduction and a discussion concerning the functionality and the handling of derivatives; in the lecture the chosen examples will be taken from interest derivatives. Students will learn estimating not only the risks of derivatives, but also the opportunities, and know about their capabilities concerning the protection of underlying transactions.

Outline of the course

| Teaching unit (90 min.) | Topic |
|----------------------------|---|
| 1 | Overview of the course. Simple vs. compound interest |
| 2 | Computation of interest. Compounding frequencies. Continuous compounding. |
| 3 | Exercises of interest. Introduction to discounted cash flow valuation. |
| 4 | Present value of cash flows. Perpetuities |
| 5 | Growing perpetuities. Annuities. |
| 6 | Annuities and equivalence of payments. |
| 7 | Loan Amortization |
| 8 | Investing decisions (net present values vs. internal rate of return) |
| 9 | Investing decisions (net present values vs. internal rate of return) |
| 10 | Equivalent annual value and exercises. |
| 11 | Interest rate financial instruments |
| 12 | Interest rate financial instruments |
| 13 | Introduction to interest rate derivatives |
| 14 | Introduction to interest rate derivatives |
| 15 | Preparation for the exam |

Course Intended Learning Outcomes and their Contribution to Program Intended Learning Outcomes / Program Goals

| Program Goals | Learning objectives of the event | Testing method |
|---|---|--|
| Upon completion of the program, students will be able to... | Upon completion of the course, students will be able to... | Written exam 100% Individual performance |
| 1 Expertise | | |
| 1.1 ...demonstrate their differentiated and in-depth competencies in general business administration. | ... to be able to explain different financial products in terms of their use and their mode of action. | x |
| 1.4 ...be able to solve business problems using quantitative methods and based on sound data research skills. | ... be able to set up financial mathematical models for the topics of investment decisions, pension calculations, redemption schedules and securities prices, calculate them and interpret the results. | x |
| 2 Digital competencies | | |
| 2.2 ...effectively use the information systems found in the operational environment to solve problems. | ... use MS-Excel for software-based solution of financial mathematical problems. | x |
| 3 Critical thinking and analytical skills | | |
| 3.1 ...use appropriate methods competently and apply them to complex problems. | ... competently select financial mathematical methods and apply them to different problems. | x |
| 3.2 ...interpret results comprehensively, reflect critically and develop their own holistic solution alternatives for complex issues. | ... interpret and reflect on the results of their calculations. | x |
| 4 Ethical awareness and sustainability | | |
| 5 Communication and teamwork skills | | |
| 5.1 ...express complex issues in clear written form. | ... describe the financial mathematical problems in exact mathematical notation and verbalize them contextually in the exam. | x |
| 6 Internationalization | | |

Teaching and Learning Approach

The concept of the course is that of a "classical lecture" which is "loosened up" by examples, exercises and discussions. In the lecture the classical tools for analyzing questions from the field of financial mathematics is provided. The focus of the lecture is on the practical implementation of financial mathematical methods in practice and on their interpretation. Especially it is intended to promote abstract thinking and model building techniques.

Literature and Course Materials

- Ross, S., Westerfield, R., and Jaffe, J. (2013). *Corporate Finance* (1072 p.) (10th ed.). New York.: McGraw- Hill/Irwin.

- Luenberger, D. G., (2013). *Investment Science* (2nd ed.). Oxford University Press.

- Hull, J.C. (2015). *Options, Futures and Other Derivatives* (9th ed.). Pearson.

Assessment

The credit consists of a 60-minute written exam at the end of the semester.

Schedule

see above