

# SYLLABUS

REGARDING THE QUALIFICATION CYCLE FROM 2026 TO 2029

ACADEMIC YEAR 2028/2029

## 1. BASIC COURSE/MODULE INFORMATION

Course/Module title	Introduction to Financial Mathematics
Course/Module code *	
Faculty (name of the unit offering the field of study)	Faculty of Exact and Technical Sciences
Name of the unit running the course	Institute of Mathematics
Field of study	Mathematics
Qualification level	First-cycle studies (Bachelor's)
Profile	General academic
Study mode	Full-time
Year and semester of studies	Year 3, Semester 6
Course type	Specialisation course
Language of instruction	English
Coordinator	Rostyslav Hryniv, PhD, DSc
Course instructor	Rostyslav Hryniv, PhD, DSc

\* - as agreed at the faculty

### 1.1. Learning format – number of hours and ECTS credits

Semester (no.)	Lectures	Classes	Laboratories	Seminars	Practical classes	Internships	others	ECTS credits
6	30		30					5

### 1.2. Course delivery methods

- conducted in a traditional way  
 involving distance education methods and techniques

### 1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

- Lecture – pass without a grade  
 Laboratory – pass with a grade

## 2. PREREQUISITES

Knowledge of calculus 1, 2 and basic of economics.

## 3. OBJECTIVES, LEARNING OUTCOMES, COURSE CONTENT, AND INSTRUCTIONAL METHODS

### 3.1. Course/Module objectives

O1	Familiarization students with knowledge concerning: parameter estimation, verification of linear econometric models.
O2	Familiarization students with knowledge concerning: parameter estimation, verification of nonlinear models.
O3	Familiarization students with knowledge concerning: linear programming and the Simplex method.

### 3.2. COURSE/MODULE LEARNING OUTCOMES (TO BE COMPLETED BY THE COORDINATOR)

Learning Outcome	The description of the learning outcome defined for the course/module	Relation to the degree programme outcomes
LO_01	The student has knowledge of basic concepts of financial mathematics and basic computational techniques.	K_Wo8,K_Wo7
LO_02	The student is able to use IT tools to solve typical test tasks.	K_U16,K_U22
LO_03	Through knowledge of modeling and the ability to program scripts, the student is ready to fulfill social obligations resulting from the nature of work related to financial data analysis, as well as to take action in solving problems and performing tasks typical for professions related to financial data analysis.	K_Ko4,K_Ko5,K_Ko7

### 3.3. Course content (to be completed by the coordinator)

#### A. Lecture

Content outline

Introductory issues. Basic concepts used in Financial Mathematics.

Interest, discounting, interest rate, rate of return.
Capitalization methods. Simple interest, compound interest (decursive, anticipative), continuous compounding.
Types of interest rates and their applications. Nominal rate, relative rate, equivalent rate, average rate.
Deposits. Annuities (savings plans and capital annuities).
Loans and borrowings. Repayment schedule, additional costs, effective interest rate on a loan.
Nominal and real value of capital.
Valuation of debt instruments using the discounted cash flow method.
Optimal investment portfolio.

B. Classes, laboratories, seminars, practical classes

Content outline
Familiarization with the class program and the course completion method.
Introductory issues. Capitalization methods. Simple interest, compound interest (decursive, anticipative), continuous compounding.
Nominal, relative, equivalent, and average interest rates.
Deposits. Savings plans and capital annuities.
Loans and borrowings. Debt repayment schedule.
Nominal and real value of capital.
Valuation of bonds and shares using the discounted cash flow method.
Promissory notes and treasury bills.
Basic characteristics of stock rates of return.
Constructing an optimal investment portfolio.

**3.4. Methods of Instruction**

**Lecture:** a problem-solving lecture/a lecture supported by a multimedia presentation/ distance learning

**Laboratory classes:** computer work, practical project.

**4. Assessment techniques and criteria**

**4.1 Methods of evaluating learning outcomes**

Learning outcome	Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes)	Learning format (lectures, classes,...)
LO_01	observation during classes, laboratory tasks	lab
LO_02	observation during classes, laboratory tasks	lab

LO_03	observation during classes, laboratory tasks., test	lab, lecture
-------	--	--------------

#### 4.2 Course assessment criteria

Passing the laboratory classes:

Individual assessment of completed laboratory tasks during an individual interview. The grade is based 50% on the correctness of the completed work and 50% on the correctness of the answers to the questions asked. The condition for passing the laboratory classes is obtaining at least 50% of the points for each task. The final grade is then determined according to the following scale:

- below 50% pts. – fail
- [50 – 60%] pts. – satisfactory
- [60 – 70%] pts. – satisfactory plus
- [70 – 80%] pts. – good
- [80 – 90%] pts. – good plus
- [90 – 100%] pts. – very good

Activity during classes may raise the final grade by a maximum of half a grade.

Passing the lectures based on a test; the condition for passing is obtaining at least 50% correct answers.

#### 5. Total student workload needed to achieve the intended learning outcomes – number of hours and ECTS credits

Activity	Number of hours
Course hours	60
Other contact hours involving the teacher (consultation hours, examinations)	5
Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.)	60
Total number of hours	125
Total number of ECTS credits	5

\* One ECTS point corresponds to 25-30 hours of total student workload

## 6. Internships related to the course/module

Number of hours	<i>Not applicable</i>
Internship regulations and procedures	<i>Not applicable</i>

## 7. Instructional materials

Compulsory literature: <ol style="list-style-type: none"><li>1. Kellison, S. G. (2009). <i>The theory of interest</i>. McGraw-Hill.</li><li>2. Broverman, S. A. (2017). <i>Mathematics of investment and credit</i> (6th ed.). ACTEX Learning.</li><li>3. Petters, A. O., Dong, X. (2016). <i>An introduction to mathematical finance with applications</i>. Springer.</li></ol>
Complementary literature: <ol style="list-style-type: none"><li>1. Loveland, J. (2018). <i>Mathematical methods in finance</i>. CRC Press.</li><li>2. Capinski, M., Zastawniak, T. (2003). <i>Mathematics for finance: an introduction to financial engineering</i>. Springer.</li><li>3. Wickham, H., Çetinkaya-Rundel, M., Golemund, G. (2023). <i>R for data science</i>. O'Reilly Media.</li></ol>

Approved by the Head of the Department or an authorised person