SGH

Year	2023/2024
Course title	Mathematics of Finance
Course number	121191 - 0998 3 ECTS points
Lecturer	Pruchnicka-Grabias Izabela , PhD

A. Course objective

Develop understanding of fundamental concepts and mathematical tools used in finance, banking, accounting, and insurance.

B. Abstract

Simple interest, simple discount. Compound interest. Time value of money. Annuities. Loan amortization methods. Annual percentage rate of charge for consumer credits. Tools for assessment of financial investments (NPV, IRR, duration, payback period). Basics of bond valuation and selected financial instruments. Use of Excel in financial problems.

C. Learning outcomes

Knowledge

Principles and features of accumulating and discounting.

Principles of cash flow valuation: annuities, including loan repayment, bonds, and financial investments.
The essence of equivalence in financial mathematics.

Skills

Valuation of single amounts, bills, T-bills, and cash flows using appropriate techniques and tools, including Excel tools.
Competence in constructing a loan repayment scheme under various requirements, and its assessment.
Competence in comparing cash flows, including loans and financial investments, and describing their features with the use of appropriate tools.

Social competencies

Competence in providing a user-friendly interpretation of results.
Understanding of implications of using selected approaches or decisions in the area of financial transactions.

D. Main issues

1	Simple interest. Simple discount. The equivalence of simple interest rates. Time measurement in finance
2	Bank discount (interest in advance). Equivalence of interest rate and discount rate. Commercial bills - discounting, equivalence, portfolio. Treasury bills - primary market auction, discount rate, equivalent rate of return.
3	Compound interest: periodic compounding, continuous compounding. Annual accumulation factor. Effective rate of interest.
4	Nominal rate of interest. Equivalent rates of interest. Compound discounting.
5	Varying interest rates, average rate. Inflation, deflation. Fischer's formula, real rate of interest.
6	Time value of money. Exponential compounding. The value of dated amounts at different points in time: the present value (PV), the future value (FV).
7	Equivalence of dated values, equation of value.
8	Annuity. The main types of annuities. The present (PV) and the future value (FV) of annuity.
9	Level payment annuity. Annuity accumulation factor, annuity discount factor. Valuation of annuities in Excel.
10	Deferred annuity. Perpetuity. General annuity.
11	Assessment of financial investments: net present value (NPV), internal rate of return (IRR). Mathematical aspects of IRR existence and calulation.
12	Discounted payback period, duration. Assessment of investments in Excel.
13	Methods of loan amortization. The general principle of loan repayment. Retrospective, and prospective approach. Amortization table.
14	Level payments, level principal repayments. Loan repayment under simple interest.
15	The annual percentage rate of charge for consumer credits (APR). Ambiguity of APR under simpe interest. Use of Excel.

E. Basic literature

M. M. Parmenter, Theory of Interest and Life Contingencies, with Pension Application: A Problem-Solving Approach. ACTEX Publications

F. Supplementary literature

Kellison S.G., The Theory of Interest, 2nd ed., Irwin Homewood, Boston 1991

G. Author's most important publications concerning the offered course

Izabela Pruchnicka-Grabias, Analiza stóp zwrotu z funduszy hedgingowych za pomocą miar efektywności opartych na dolnych momentach cząstkowych , W: PRACE NAUKOWE UNIWERSYTETU EKONOMICZNEGO WE WROCŁAWIU,2018; Izabela Pruchnicka-Grabias, An empirical study on retirement investments,W: red. Ivana Barković Bojanić, Aleksandar Erceg, Aging Society - Rethinking and Redesigning Retirement ,2020; Izabela Pruchnicka-Grabias, Krzysztof Borowski, Optimal lengths of moving averages for the MACD oscillator for companies listed on the Warsaw Stock Exchange, W: Bank i Kredyt,2019

H. Numbers of required prerequisites

not required

I. Course size and mode

	Full-time	Saturday-Sunday	Afternoon
Total:	30	21	30
Lecture	30	14	30
Self-study under the supervision of lecturer	-	7	-

J. Final mark (assessment)

traditional examination	90%
reports	10%

K. Foreign language requirments

English

L. Selection criteria

M. Methods applied

Lecture
Self-study under the supervision of lecturer