

**Faculty of Economics / Ekonomija (2017.) / FINANSIJSKA I AKTUARSKA MATEMATIKA**

Prerequisites	No conditionality
Aims	The subject aims to enable students to understand the basic definitions, theorems, principles and methods of financial mathematics, which are widely used in economics, e.g. in financial management, securities, banking business, insurance, ...
Lecturer / Teaching assistant	prof. dr Vladimir Kaščelan, doc. dr Saša Vujošević, Tanja Mirotić
Method	A classical lecture and exercises. Discussion and clarification during lectures. Short oral test of understanding and knowledge of the subject matter of the lectures, with the active participation of students in solving problems. It is planned one test and final exam.
Week 1, lectures	Classical calculations in economic mathematics: division, proportions, mixtures, percentage calculation Depreciation of fixed assets.
Week 1, exercises	Classical calculations in economic mathematics: division, proportions, mixtures, percentage calculation Depreciation of fixed assets.
Week 2, lectures	The concept of the time value of money - the equivalence principle. Interest calculation (decursive and anticipative method). Equivalent interest rates. Simple and compound interest. Discounting (present value) method and method of prolongation
Week 2, exercises	The concept of the time value of money - the equivalence principle. Interest calculation (decursive and anticipative method). Equivalent interest rates. Simple and compound interest. Discounting (present value) method and method of prolongation. (Quiz 1)
Week 3, lectures	Nominal, relative and effective interest rate. Discounting short term bonds. Price determination of instruments in the money market
Week 3, exercises	Nominal, relative and effective interest rate. Discounting short term bonds. Price determination of instruments in the money market. (Quiz 2)
Week 4, lectures	Consumer loans. Streams of payments - periodic cash inflow and outflow. Investment loans
Week 4, exercises	Consumer loans. Streams of payments - periodic cash inflow and outflow. Investment loans. (Quiz 3)
Week 5, lectures	Conversion of the loan. Intercalary interest. Profitability of investments.
Week 5, exercises	Conversion of the loan. Intercalary interest. Profitability of investments. (Quiz 4)
Week 6, lectures	Evaluation of long-term bonds. Determination of stock value
Week 6, exercises	Evaluation of long-term bonds. Determination of stock value. (Quiz 5)
Week 7, lectures	Generalization of the theory of interest rates- effective and nominal interest rates. Theorem on accumulation factor.
Week 7, exercises	Generalization of the theory of interest rates- effective and nominal interest rates. Theorem on accumulation factor. (Quiz 6)
Week 8, lectures	Present value of discrete and continuous cash flows. Internal rate of return (IRR). Comparison of two investment projects.
Week 8, exercises	Present value of discrete and continuous cash flows. Internal rate of return (IRR). Comparison of two investment projects. (Quiz 7)
Week 9, lectures	Effective interest rates on loans and deposits. The case of different active and passive interest rates. DPP discounted payback period. The impact of inflation.
Week 9, exercises	Effective interest rates on loans and deposits. The case of different active and passive interest rates. DPP discounted payback period. The impact of inflation. (Quiz 8)
Week 10, lectures	Derivatives- forwards, futures, swaps and options. Test
Week 10, exercises	Derivatives- forwards, futures, swaps and options. (Quiz 9)
Week 11, lectures	Basic concepts of probability theory- classical definition, random variables and their expectation Introduction to actuarial mathematics. Biometric functions. Mortality rate. Expected and probable life duration.
Week 11, exercises	Basic concepts of probability theory- classical definition, random variables and their expectation Introduction to actuarial mathematics. Biometric functions. Mortality rate. Expected and probable life duration. (Quiz 10)
Week 12, lectures	Life annuities payable annual (single net premium). Life insurance (single net premium)- pure endowment, whole life insurance (annual case), endowment. Make-up test
Week 12, exercises	Life annuities payable annual (single net premium). Life insurance (single net premium)- pure endowment, whole life insurance (annual case), endowment.

Week 13, lectures	Life insurance on the fixed term. Annuities payable $m$ times a year.
Week 13, exercises	Life insurance on the fixed term. Annuities payable $m$ times a year.
Week 14, lectures	Case of more than one premium (net premiums). Premiums payable $m$ times per year.
Week 14, exercises	Case of more than one premium (net premiums). Premiums payable $m$ times per year.
Week 15, lectures	Gross premium calculation. Repetition.
Week 15, exercises	Gross premium calculation. Repetition.
Student obligations	Students are required to attend classes.
Consultations	Available information on website and noticeboard.
Workload	6
Literature	
Examination methods	Test - 40 points Final exam - 50 points 10 Quizzes - 10 points
Special remarks	
Comment	
Learning outcomes	After completion of this course the student will be able to: 1. Define simple and complex proportion, division of given value, weighted average and apply the percentages to solve business mathematics tasks. 2. Define the anticipative and decursive method of interest calculation, nominal, relative and effective interest rate and apply these concepts in determining the prices of instruments in the money market. 3. Determine the annuity and to make a plan of repayment of consumer and investment loans. 4. Apply the equivalence principle and the methods of discounting and prolongation in testing the profitability of investments, as well as in evaluation of long-term bonds and shares. 5. Calculate the discount factor with a variable interest rate, applied it to periodic annuities and compare it with the discount factors in discrete and continuous case with a constant interest rate. 6. Calculate the discount factor in insurance-technical sense, define biometric functions and apply financial mathematics and probability to solve simple actuarial mathematics tasks. 7. Describe the types of life insurance and to calculate the net and gross premium for each of them.