Faculty of Economics / ECONOMICS / Financial mathematics at financial markets

Course:	Financial mathematics at financial markets			
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
4176	Mandatory	1	7	2+0+0
Programs	ECONOMICS			
Prerequisites	-			
Aims	The course is the base for the remaining two disciplines in the Actuarity department			
Learning outcomes	After completion of this course the student will be able to: 1. Appoint and define the basic concepts in the financial market. 2. Apply the equivalence principle and the method of discounting and prolongation to short-term and long-term bonds, shares and to testing of investment profitability. 3. Define the effective interest rate on bank deposits and loans and compare it with the internal rate of return from the calculative point of view. 4. Generalize the discount factor for the case of variable interest rates and apply it in finance. 5. Define the term contracts and determine their prices. 6. Apply a portfolio analysis and create different models in insurance. 7. Prepare verbal and written presentation from financial mathematics in the financial market.			
Lecturer / Teaching assistant	Vladimir Kascelan, full professor			
Methodology	Lectures with the active participation of students. Seminar paper with the theme of financial markets. It is planned two tests and essay.			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Concept, types and characteristics of financial markets. Functions, objectives and participants in the capital market			
I week exercises	Concept, types and characteristics of financial markets. Functions, objectives and participants in the capital market			
II week lectures	Principles and methods of financial mathematics. Interest account: anticipative and decursive interest. Simple and compound interest. Compounding m times a year. Effective interest rate. Continuous compounding			
II week exercises	Principles and methods of financial mathematics. Interest account: anticipative and decursive interest. Simple and compound interest. Compounding m times a year. Effective interest rate. Continuous compounding			
III week lectures	Rate of return and the discounted rate. Determination of price of short-term securities. Streams of payments – periodic cash inflow and outflow. IRA accounts. Loans. Securities prices and yields. Yield curve. Bonds. Yield to maturity, duration, modif			
III week exercises	Rate of return and the discounted rate. Determination of price of short-term securities. Streams of payments – periodic cash inflow and outflow. IRA accounts. Loans. Securities prices and yields. Yield curve. Bonds. Yield to maturity, duration, modif			
IV week lectures	The nominal versus effective interest rates. Theorem on accumulation factor. Present value function. The effective interest rates on deposits and bank loans			
IV week exercises	The nominal versus effective interest rates. Theorem on accumulation factor. Present value function. The effective interest rates on deposits and bank loans			
V week lectures	Discrete and continuous cash flows. Investment profitability. Internal rate of return (IRR). Comparison of two investment projects. Discounted payback period (DPP). Impact of inflation			
V week exercises	Discrete and continuous cash flows. Investment profitability. Internal rate of return (IRR). Comparison of two investment projects. Discounted payback period (DPP). Impact of inflation			
VI week lectures	Test no. 1			
VI week exercises	Test no. 1			
VII week lectures	Financial derivatives. Forward and futures contracts. Options. Binomial tree model and the concept of replication potfolio. Cox-Ross-Rubinstein formula.			
VII week exercises	Financial derivatives. Forward and futures contracts. Options. Binomial tree model and the concept of replication potfolio. Cox-Ross-Rubinstein formula.			
VIII week lectures	Stock-options. Black-Sholes formula. Greek parameters			
VIII week exercises	Stock-options. Black-Sholes formula. Greek parameters			

IX week lectures	Swaps
IX week exercises	Swaps
X week lectures	Portfolio analysis in insurance. Portfolio management strategies. Expected return on a portfolio. Two and several securities. Efficient frontier. Capital market efficiency
X week exercises	Portfolio analysis in insurance. Portfolio management strategies. Expected return on a portfolio. Two and several securities. Efficient frontier. Capital market efficiency
XI week lectures	Portfolio analysis in insurance. The process of portfolio selection. One factor model. Multiple factors models. Immunization strategy. Transformation of equity into a zero-coupon bonds.
XI week exercises	Portfolio analysis in insurance. The process of portfolio selection. One factor model. Multiple factors models. Immunization strategy. Transformation of equity into a zero-coupon bonds.
XII week lectures	Test no. 2
XII week exercises	Test no. 2
XIII week lectures	CAPM (Capital Asset Pricing Model). APT- valuation model of financial assets on the basis of the arbitrage
XIII week exercises	CAPM (Capital Asset Pricing Model). APT- valuation model of financial assets on the basis of the arbitrage
XIV week lectures	Stochastic calculations in finance
XIV week exercises	Stochastic calculations in finance
XV week lectures	Essay
XV week exercises	Essay
Student workload	per week 7 credits x 40/30 = 9.33 pm Structure: 2 hours of lectures 7.33 hours of independent work, including consultations per semester Total workload for the course 7x30 = 210 hours Structure: Lectures and final exam: 9.33x16weeks = 149.28 hours Preparation before the start of the semester (administration): 9.33x2 = 18.66 hours. Additional work to prepare for and take the make-up exam 42.06 hours

Per week	**Per semester**
7 credits x 40/30=9 hours and 20 minuts 2 sat(a) theoretical classes 0 sat(a) practical classes 0 excercises **7 hour(s) i 20 minuts** of independent work, including consultations	Classes and final exam: **9 hour(s) i 20 minuts x 16 =149 hour(s) i 20 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **9 hour(s) i 20 minuts x 2 =18 hour(s) i 40 minuts** Total workload for the subject: **7 x 30=210 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **42 hour(s) i 0 minuts** Workload structure: **149 hour(s) i 20 minuts (cources), 18 hour(s) i 40 minuts (preparation), 42 hour(s) i 0 minuts (additional work)**
Student obligations	Students are required to attend classes
Consultations	after lectures
Literature	: V.Kašćelan Finansijska matematika I- chrestomathy, EF Podgorica 2003; B.Laković V. Kašćelan Privredna i finansijska matematika, EF Podgorica 1997; J.Kočović M. Pavlović Uvod u finansijsku matematiku EF Belgrade, 2010; Selection of more foreign books
Examination methods	2 tests and essay. The mark is formed according to the ECTS scale.
Special remarks	
Comment	

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points