

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ КЫРГЫЗСКОЙ РЕСПУБЛИКИ КЫРГЫЗСКИЙ ЭКОНОМИЧЕСКИЙ УНИВЕРСИТЕТ

им. М.Рыскулбекова

Name of discipline and code: B.2.4.1. Financial mathematics

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Lecturer	Supaeva Gulnaz Tunaevna								
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Amount of credits:	2								
Date:	6-semester 2017-2018 academic year								
Purpose and	Studying the discipline "Financial Mathematics" is an important part of								
objectives of the	the professional training of students. Any financial, credit or								
course	commercial operation involves a set of conditions agreed upon by its participants. These conditions include: the amount of the loan, loan or investment, the price of the goods, terms, ways of calculating interest and repaying the debt, etc. The combined effect on the financial operation of many factors makes its final result unobvious. To assess it, a special quantitative analysis is necessary. The totality of calculation methods is the subject of the course. The goal of the course is to help students master the basics of modern financial computing for applying the knowledge gained while solving specific problems in the field of economics.								
Course Description	The discipline "Financial Mathematics" contains a systematic exposition of the basic concepts and methods of financial calculations and the quantitative analysis of financial transactions. The content of the classical course covers the basic sections of financial mathematics: calculations for simple and complex interest rates; financial rents; financial analysis of investments; financial settlements on securities. The program of the discipline "Financial Mathematics" is built on the basis of modern requirements of GOST to the level of training of economists.								
Prerequisites disciplines	The course deals with the basic concepts that operate in financial computing: interest, interest rate, discount rate, current (current) cost of payment, methods for increasing and discounting payments, the principles underlying financial calculations, the current practice of calculations, the scope of their application.								
Post-requisition discipline	 Basic concepts and definitions of values used in financial calculations Types of interest rates Simple and compound interest formulas Scope of simple and compound interest formulas Interest calculation methods used in the world practice Formulas for calculating the final result when calculating interest on a variable rate over time The essence of the discount operation. Two methods of discounting: mathematical discounting and accounting operation Interest accrual at a simple and complex discount rate • The essence of inflation. Measurers of inflation. Effects of inflation. Increment of amounts at a simple and complex rate in the conditions of inflation. 								

	Gross rate. Real bet. Methods of compensation for losses from inflation. • Formulas for calculating the average profitability of financial
	transactions for a fixed period • The formula for accumulation at a
Competencies	constant rate of interest • Scope of continuous interest Know: simple and compound interest as the basis of transactions
Competencies	associated with the expansion or discounting of payments;
	the principle of rate equivalence as the basis of many methods of
	quantitative analysis;
	methods for calculating the general characteristics of payment flows in
	relation to various types of financial rents;
	To be able: to make accretion on simple and difficult percent; to carry out discounting and accounting for simple and complex interest
	rates;
	assess the consequences of replacing one financial obligation with
	others and draw reasoned conclusions;
	plan and evaluate the effectiveness of financial and credit operations;
	plan long-term debt repayment; to make financial settlements on
	securities; plan and analyze investment projects; calculate the figures for leasing, factoring and forfeiting operations; to make actuarial
	calculations on life insurance.
	Use:
	Skills of financial control in organizations
	Financial methodologies for solving set financial problems
	Methodology of collection, processing, analysis and systematization of
	financial information with the provision of information security
	requirements. Methodology of analysis of calculation results.
	Wethodology of analysis of calculation results.
Course Policy	Do not be late for classes
	Do not skip classes, in case of illness, provide a certificate
	If the tasks are not fulfilled, the assessment is reduced
	Actively participate in the educational process Timely and diligently to do homework
	Be tolerant, open and friendly to fellow students and teachers
	Constructively support feedback in all classes
	Be punctual and compulsory
Teaching methods:	Active method, passive method, interactive method
Form of knowledge	Assessment of knowledge will be conducted on the basis of the
control	European ECTS system. The ECTS system initially divides students
	between the theses "credits", "not credits", and then assesses the work of
	these two groups separately.
	Students who score more than 50 points receive a "pass" rating. "Excellent" (from 85 to 100 points), "good" (from 70 to 84 points),
	"satisfactory" (from 50 to 69 points).
	The points of the final evaluation are distributed as follows:
	Current control work (max) -40 points
	Border control work (max) -40 points
	Final control (written examination max) -20 points
	At deducing of a total estimation activity of students in the decision of
	the problems offered on employment will be considered.

Literature: Basic	• The current test (homework) is necessary to consolidate the material studied, as well as to check the level of understanding of the material. Homework will contain calculation tasks that use basic facts and statements. Doing homework will give students the opportunity to understand the material they have passed. • Border testing is given to check knowledge of current materials. We will propose computational tasks, as well as theoretical tasks that reveal an understanding of the basic definitions. Correct execution of tests will give students a chance to gain high credit marks. One of the basic conditions for recruitment of high scores is the student's possession of the material he has passed at a sufficiently high level. Test works will be held at the set time. Retake of control works is not provided. • Final control is a written examination. After receiving the exam ticket, the student must write down the answers to exam questions in writing. In order that students can properly prepare for the exam, a list of exam questions is given in advance. The answer is considered best if the theoretical facts are illustrated by concrete examples. 1. Chetyrkin E.M. Methods of financial and commercial calculations. M.: BUSINESS LTD., 2001. 2. Kutukov V.B. Fundamentals of financial and insurance mathematics. M: BUSINESS. 2003. 3. Melkumov Y.S. Theoretical and practical guide to financial computing. M.: INFRA-M. 1996. 4. Chetyrkin E.M. Financial analysis of production investments. M: BUSINESS. 1998. 5. Kochovich E. Financial Mathematics. M.: "Finances and statistics". 2010. 6. Kapitonenko V.V. Financial mathematics and its applications: V4e6-mpakr. manual for universities M.: "PRIOR Publishing House", 1998 144s. 7. S.K. Kydyraliev, A.B. Urdaletova, A.E. Kasymov, K.S. Kydyraliev «Intro to corporate finance & investments », Bishkek 2012
Additional	1. Shirshov EV, Petrik NI, Tutygin AG, Serova G.V. "Financial Mathematics" 3rd ed., Pererab. and add-M.: KNORUS, 2006-144p. 2. Chuyko A.S., Shernev V.G. "Financial Mathematics": Proc. BenefitsM: INFRAM, 2017-160c. 3. Kapitonenko V.V. "Financial mathematics and its applications" Учебпракт. manuals for universitiesM: PRIOR Publishing House, 1999p.144.
Independent work of	Homework №1
a student	(Deadline 05.03.18 -10.03.18)
	1) Find the rate of simple interest and the rate of simple discount,
	knowing that 800 soms were deposited and after 2 months 850 soms
	were received.
	2) Gregory received 5000 soms for 5 months. How much money he must return:
	a) at 28% discount rate; b) at 32% simple interest rate?
	3) Find amounts of simple interest and discount if at interest rate of 37,5% and discount rate of 30% you must return \$3600 after:
	a) a year, b) 8 months; c) 5 months.

- 4) Ellen has 2 options of depositing money for a year. The first option yields 15% discount rate during 1-8 months and 24% interest rate the rest of the period. The second option gives 22% interest in the 1st quarter and 16% discount in 4-12 months. Which option is more profitable?
- 5) What is the nominal interest rate, if the semiannual compounded effective interest rate is 21%?
- 6) Find FVA, if: a) F = 200, n = 13, r = 17%, t = 1 year;
 - b) F = 325, n = 17, r = 33%, t = 4 months.
- 7) Find PVA, if: a) V = 300, n = 30, r = 3%, t = 1 year;
 - b) V = 400, n = 40, r = 40%, t = 1 quarter.
- 8) How will the price of apartments that are now worth \$5000 change, if they can be leased at the price of \$80 per month with 12% expected yield?
- 9) Estimate a share, for which \$11 dividends will be paid tomorrow. The dividends are paid twice a year; the expected yield is 14%.
- 10) If you deposit 10 000 soms every quarter during 20 years, how much (maximum) will you be able to indefinitely withdraw every quarter. Interest rate 20%?

Homework №2 (Deadline 23.04.18 -28.04.18)

- 1) Determine x_n , using provided data
- a. $x_0 = 1000$; n = 10; a = 1,14; b = 100;
- b. $x_0 = 1500$; n = 16; a = 0.94; b = 100;
- c. $x_0 = 5000$; n = 10; a = 1,4; b = -2100;
- d. $x_0 = -2500$; n = 8; a = 2; b = 3100;
- 2) A loan of 14 000 soms is taken for 10 months. How much should be returned, if the interest rate is 40%.
- 3) Dima promised to return 2100 soms in 5 months at a discount rate of 18%. How much he received?
- 4) Gulnara received a loan on January 10 at a rate of 24% interest. On July 10 she paid part of the loan by paying 520 thousand soms, and on 10th December she completely paid off the loan by paying 710 thousand soms. How much money was received in the loan?
- 5) Azat took out a mortgage loan to buy a house for \$240 000. According to the arrangements, he made an initial payment of \$80 000, and should pay out the debt making fixed payments at the end of every quarter during next 10 years, at 8% interest rate. Determine the fixed amount of payments. How much will Azat owe to the bank in 6 years?
- 6) Chinara buys a house for 95 000 euro with the help of a mortgage loan. According to the arrangements, the initial payment is 30% of the total amount, and the rest should be paid off making fixed payments every month during 7 years. Determine the amount of the 1st payment, considering that the interest rate is 16%.
- 7). What is the expected return on share A, if the expected return on a portfolio, consisting of 30% of A shares, 70% of B shares, is equal to 12% and expected return on share B is 11,4%?
- 8). The expected return *r* on assets A and B is represented by the table:

_	A	В
The case of economic growth	14%	4%
The case of recession	5%	25%

		Knowing that the probability of economic growth is 0,65, the									
	probability of recession is 0,35, determine a portfolio with minimal risk.										
	9). Determine whether the return on assets A and B in CAPM model is										
	estimate	estimated correctly, if the risk-free asset's return is $r_f = 8\%$.									
	β r										
		A 1,15 16,9%									
		В	1,4	18,9%							
	At whice	ch value of r_f we can say the	hat the assets are estimated	correctly?							
	10) a)D	etermine the inflation rat	e, knowing that the real ra	ate of							
	return i	s 8%, and the nominal ra	te of return is 45%.								
	b). Infla	ation rate, in each quarter	, is 5%. What is the annua	al inflation?							
Note	Homew	ork should be presented	in the exact time set by th	e teacher. In							
	the case	e of delivery of work af	ter a fixed period, 50% of	of the points							
	receive	d by the student for work	are removed.	_							

Calendar-thematic plan of distribution of hours with the indication of the week, topics

№	Date	Subject	Number of hours	Literature	Preliminary questions on modules
1	26.01.2018	Simple interest. Simple discount	2	Literature: Basic 1. Chetyrkin E.M. Methods of financial and commercial calculations. M.: BUSINESS LTD., 2001. 2. Kutukov V.B. Fundamentals of financial and insurance mathematics. M: BUSINESS. 2003. 3. Melkumov Y.S. Theoretical and practical guide to	1. What does the multiplying factor in the composition of a simple percentage increase? 2. How is the accretion of simple percentages and arithmetical pro-ressia related to each other? 3. What is the difference between the exact and the approximate percentage? 4. What does the multiplier of discounting in the formula for increasing simple prices? 5. If the simple interest rate is doubled, how is the accrued amount?
2	2.02.2018	Compound Interest. Effective Interest Rate	2	financial computing. M .: INFRA-M. 1996. 4. Chetyrkin E.M. Financial analysis of production investments. M: BUSINESS. 1998.	1. In what cases does the bank discounting operation apply? 2. Is it true that for a simple discount rate a bill can be considered for any time to maturity? 3. What is the difference between an antipathic and

				5. Kochovich E. Financial Mathematics. M .: "Finances and	a decursive way of calculating interest?		
3	09.02.2018	Geometric progression. Future value of annuity The Present Value of an Annuity	2	statistics". 2010. 6. Kapitonenko V.V. Financial mathematics and its applications: Учеб практ. manual for universities M .: "PRIOR Publishing House", 1998 144s. 7. S.K. Kydyraliev, A.B. Urdaletova, A.E. Kasymov, K.S. Kydyraliev «Intro to corporate finance & investments », Bishkek 2012 Additional 1. Shirshov EV, Petrik	1) What is the multiplication factor for accruing interest on a complex loan rate? 2) How do the accumulated amounts relate to each other when calculating simple and compound loan interest? 3) Is it true that charging compound interest at a rate of 12% per annum is equivalent to charging compound interest at a rate of 1% per month? 4) How to use the financial tables in calculating the accrued and adjusted value?		
4	16.02.2018	Infinitely Decreasing Geometric Progression. Stock Valuation	2	NI, Tutygin AG, Serova G.V. "Financial Mathematics" 3rd ed., Pererab. and add-M.: KNORUS, 2006-144p. 2. Chuyko A.S., Shernev V.G. "Financial Mathematics": Proc. BenefitsM: INFRAM, 2017-160c. 3. Kapitonenko V.V.	1. What is the discounting factor multiplied by discounting at a complex discount rate? 2. Can accounting at a complex discount rate lead to negative values? 3. What happens to the amount of recorded capital, if the number of operations of discounting at a complex discount rate is growing?		
5	19.02.2018	Investment coefficients	2	"Financial mathematics and its applications" Учебпракт. manuals for universitiesМ: PRIOR Publishing House, 1999р.144.	1.What is the effective rate? On what parameters does it depend? 2. How does the effective rate change with the increase in the number of compound interest charges in the year? 3. In which case does the effective loan rate coincide with the nominal rate? 4.What are the rates called equivalent?		

6	2.03.2018	Problems for review Evamination	2
7	09.03.2018	Examination №1	2
8	16.03.2018	Introduction to Linear Difference Equations	2
9	23.03.2018	Mortgage and Linear Difference Equations	2

				annually or at the end of the financial transaction?
10	30.03.2018	Difference equations in evaluation of investment projects	2	1. What cash flow is called the flow of prenumerando? Give an example. 2. What cash flow is called a post-numerando stream? Give an example. 3. How are financial tables used to estimate permanent annuities? 4. What is the annuity buildup ratio? 5. What is the discount rate of the annuity? 6. What relationship exists between the future and present value of the annuity?
11	06.04.2018	Inflation	2	1. How does the annuity growth rate change when the annuity period is changed and the interest rate is changed? 2. How does the discount rate of the annuity change with the change in the validity period of the annuity and the change in the interest rate? 3. What is the relationship between the estimates of the annuity of prenumerando and postnumerando?
12	13.04.2018	Risk and Return of stocks and portfolios	2	1. What is ransom of rent? What are the methods of solving this problem? 2. What is the essence of consolidation of rent? 3. How to replace immediate rent with deferred rent?
13	20.04.2018	Model CAPM	2	1. What credit is called consumer credit? Give examples of consumer loans

				2. List the main ways to repay the loan3. Which way of repaying the loan is most beneficial to the bank (the creditor)?
14	23.04.2018	Depreciation Methods: Mathematical Approach	2	1. Which way of repaying the loan is most beneficial to the borrower? 2. Why are banks interested in that the debtor repays the amount of debt in installments during the entire term of the loan?
15	27.04.2018	Examination №2	2	
		TOTAL	30 hours	

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Schedule of independent work of students

№	Weeks Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1 6	Amount of points
			March							April								
1	Current control		20							20							40 points	
2	Deadline IWS*.		05.03.2018-10.03.2018							23.04.2018-28.04.2018								