UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17)			
Predmet:	Finančni praktikum		
Course title:	Financial lab		
Študijski program in stopnja Study programme and level	**Študijska smer Study field**	**Letnik Academic year**	**Semester Semester**
Univerzitetni študijski program Finančna matematika	ni smeri	3	prvi
First cycle academic study programme Financial Mathematics	none	3	first

Vrsta predmeta / Course type	obvezni / compulsory
Univerzitetna koda predmeta / University course code:	M0323

Predavanja Lectures	**Seminar Seminar**	**Vaje Tutorial**	**Klinične vaje work**	**Druge oblike študija**	**Samost. delo Individ. work**	**ECTS**
15	**30**	**15**			**90**	**5**

Nosilec predmeta / Lecturer:	prof. dr. Janez Bernik, prof. dr. Tomaž Košir, prof. dr. Mihael Perman, doc. dr. Dejan Velušček

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Vpis v letnik študija. Opravljena predmeta Verjetnostni račun 1 in Finančna matematika 1.	Enrolment in the programme. Completed courses Probability theory 1 and Financial mathematics 1.
Vsebina:	**Content (Syllabus outline):**

Predmet je sestavljen iz dveh delov. Namen predavanj in seminarja je, da poglobi znanje, pridobljeno pri Finančni matematiki 1 in ga postavi na teoretične osnove, pridobljene pri Verjetnostnem računu (npr. teorija martingalov v diskretnem času) ali/in uporabi pridobljeno znanje pri teh dveh predmetih za seznanitev s stohastičnim modeliranjem v financah in zavarovalništvu (npr. kolektivni modeli, modeli za porazdelitve števila škodnih zahtevkov, modeli za porazdelitve višin škodnih zahtevkov, modeli za porazdelitve donosov). Pri laboratorijskih vajah študenti dobijo nekaj praktičnih projektov in začno z delom pod nadzorom, dokončajo pa ga sami. Možne teme za projekte so: Statistični projekt: urejanje podatkov, priprava podatkov za obdelavo, izbira statističnega modela, testiranje modela, ocenjevanje parametrov, interpretacija rezultatov, napovedovanje, preizkušanje zanesljivosti napovedi, preverjanje s simulacijami, Monte-Carlo metode, uporaba probit in logit modelov, uporaba regresijskih modelov za analizo finančnih podatkov. Finančni projekt: praktično vrednotenje opcij, rekurzivne metode, metode na podlagi simulacij, ocenjevanje “grkov”, diferenčne metode, analiza posameznih vrednostnih papirjev, izbira optimalne naložbene strategija in njena numerična implementacija, Monte-Carlo metode, vrednotenje opcij na obrestne mere ali menjalne tečaje. Aktuarski projekt: določanje premij kompleksnih zavarovalnih produktov, uporaba probit ali logit modelov za ocenjevanje tveganja, ocenjevanje verjetnosti bankrota, računanje matematičnih rezervacij, ocenjevanje dolgoročnega tveganja zavarovalnice.	Course consists of two parts. The aim of the lectures and the seminar is to deepen the understanding of the material learned in Financial Mathematics 1 course by presenting it in the theoretical framework acquired at Probability course (e.g., the theory of martingales in discrete time) and/or use the knowledge acquired in the above courses to present stochastic modeling in finance and insurance (e.g. collective models, modeling the number of claims, modeling the size of claims, modeling of returns). For the practical part students are given a couple of projects that they start to work on under supervision and finish themselves. Some possible topics for projects with practical objectives: Statistical project: data collection, data preparation, model selection, model testing, parameter estimation, interpretation, forecasting, reliability testing, simulations, Monte Carlo methods, probit and logit models, regression models for analysis of financial data. Finance project: practical evaluations of options, recursive methods, simulation methods, estimation of “greeks”, difference methods, single equity analysis, optimal investment strategies and numerical implementations, Monte Carlo methods, interest rate and currency derivatives. Actuarial project: determining the premia of complex insurance products, probit and logit models for risk assessment, probability of ruin estimation, loss reserves estimation, long-term risk estimation.

Temeljni literatura in viri / Readings:

P. Wilmott: Derivatives: The Theory and Practice of Financial Engineering, John Wiley &, Sons, New York, 1998.

W.N. Venables, B. Ripley: S-programming, Springer, 2004.

D.A. Freedman: Statistical models, Theory and Practice, Cambridge Univ. Press. 2005.

H. P. Schmidli: Risk theory, script freely available on the internet, www.math.ku.dk/~schmidli/rt.pdf .

A. Klenke: Probability Theory, A Comprehensive Course, Springer-Verlag 2006.

Cilji in kompetence:

Na eni strani je namen poglobiti teoretične osnove znanj pridobljenih pri Finančni matematiki 1 in uporabiti znanje iz verjetnosti za stohastično modeliranje v financah in zavarovalništvu.

Po drugi strani pa koncepti finančne matematike in statistike dobijo svojo pravo vrednost s praktičnimi izkušnjami. Namen praktičnega dela predmeta je spoznavanje z uporabo pridobljenega znanja v praksi. Študenti v okviru predmeta vodeno izvajajo projektne naloge iz statistike ali finančne matematike s pravimi podatki in ustreznimi računalniškimi programi.

Objectives and competences:

On the one hand the theoretical background of

concepts learned in Financial Mathematics 1 course are elucidated and skills acquired in Probability course are used in stochastic modeling in finance and insurance.

On the other, the concepts of financial mathematics and statistics only become apparent through practical experience. This is the goal of the practical part of this course. Students will prepare under tutorship projects in statistics or financial mathematics involving real-life data and computer programs.

Predvideni študijski rezultati:

Znanje in razumevanje: Razumevanje teoretičnih osnov verjetnosti, statistike in finančne matematike ter zmožnost neposredne praktične uporabe le-teh na konkretnih primerih s konkretnimi podatki. Brez ustrezne računalniške podpore ostanejo pojmi neoprijemljivi, zmanjša pa se tudi neposredna zaposljivost diplomantov.

Intended learning outcomes:

Knowledge and understanding: Understanding of the theoretical concepts in probability, statistics and financial mathematics , and the ability to apply them to concrete real-life examples and data. Without adequate computer equipment these notions remain incomplete, and the skills needed for successful employment are not developed.

Uporaba: Sposobnost praktične implementacije konceptov finančne matematike je ključ do neposredne zaposljivosti v finančno zavarovalnem sektorju. Uporaba je neposredna. Refleksija: Praktične izkušnje z vrednotenjem finančnih instrumentov omogočajo globlje in bolj trdno razumevanje bolj teoretičnega dela finančne matematike. Prenosljive spretnosti – niso vezane le na en predmet: Spretnosti so prenosljive na druga področja verjetnosti in slučajnih procesov ter matematičnega modeliranja, še najbolj pa je predmet pomemben zaradi svoje neposredne uporabnosti.	Application: The ability to implement in practice the concepts of financial mathematics is crucial for the skills development. The applications are straightforward. Reflection: The practical experience in valuation of financial products enables deeper understanding of the underlying theoretical concepts. Transferable skills: The skills obtained are transferable to all areas of probability, stochastic processes and mathematical modelling, but most of all to real-life problems.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminar in vodeno izvajanje projektov.	Lectures, seminar and projects under supervision

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): kvaliteta oddanega projekta ali več projektov, ustni zagovor ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)	100%	Type (examination, oral, coursework, project): quality of a submitted project (or more projects), oral defense grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Janez Bernik:

BERNIK, Janez, MASTNAK, Mitja. Lie algebras acting semitransitively. Linear Algebra and its Applications, ISSN 0024-3795. [Print ed.], 2013, vol. 438, iss. 6, str. 2777-2792. [COBISS.SI-ID 16553561]

BERNIK, Janez, MARCOUX, Laurent W., RADJAVI, Heydar. Spectral conditions and band reducibility of operators. Journal of the London Mathematical Society, ISSN 0024-6107, 2012, vol. 86, no. 1, str. 214-234. [COBISS.SI-ID 16357721]

BERNIK, Janez, MASTNAK, Mitja, RADJAVI, Heydar. Positivity and matrix semigroups. Linear Algebra and its Applications, ISSN 0024-3795. [Print ed.], 2011, vol. 434, iss. 3, str. 801-812. [COBISS.SI-ID 15745625]

Tomaž Košir:

GRUNENFELDER, Luzius, KOŠIR, Tomaž, OMLADIČ, Matjaž, RADJAVI, Heydar. Finite groups with submultiplicative spectra. Journal of Pure and Applied Algebra, ISSN 0022-4049. [Print ed.], 2012, vol. 216, iss. 5, str. 1196-1206. [COBISS.SI-ID 16183385]

BUCKLEY, Anita, KOŠIR, Tomaž. Plane curves as Pfaffians. Annali della Scuola normale superiore di Pisa, Classe di scienze, ISSN 0391-173X, 2011, vol. 10, iss. 2, str. 363-388. [COBISS.SI-ID 15928409]

KOŠIR, Tomaž, OBLAK, Polona. On pairs of commuting nilpotent matrices. Transformation groups, ISSN 1083-4362, 2009, vol. 14, no. 1, str. 175-182. [COBISS.SI-ID 15077977]

Mihael Perman:

KOMELJ, Janez, PERMAN, Mihael. Joint characteristic functions construction via copulas. Insurance. Mathematics & economics, ISSN 0167-6687, 2010, vol. 47, iss. 2, str. 137-143. [COBISS.SI-ID 16242777]

HUZAK, Miljenko, PERMAN, Mihael, ŠIKIĆ, Hrvoje, VONDRAČEK, Zoran. Ruin probabilities and decompositions for general perturbed risk processes. Annals of applied probability, ISSN 1050-5164, 2004, vol. 14, no. 3, str. 1378-1397. [COBISS.SI-ID 13168985]

HUZAK, Miljenko, PERMAN, Mihael, ŠIKIĆ, Hrvoje, VONDRAČEK, Zoran. Ruin probabilities for competing claim processes. Journal of Applied Probability, ISSN 0021-9002, 2004, vol. 41, no. 3, str. 679-690. [COBISS.SI-ID 13207641]

Dejan Velušček:

OSHIMA, Kojiro, TEICHMANN, Josef, VELUŠČEK, Dejan. A new extrapolation method for weak approximation schemes with applications. Annals of applied probability, ISSN 1050-5164, 2012, vol. 22, no. 3, str. 1008-1045. [COBISS.SI-ID 16384857]

VELUŠČEK, Dejan. A short note on the higher level version of the Krull--Baer theorem. Canadian

mathematical bulletin, ISSN 0008-4395, 2011, vol. 54, no. 2, str. 381-384. [COBISS.SI-ID 15907161]

VELUŠČEK, Dejan. Higher product Pythagoras numbers of skew fields. Asian-European journal of mathematics, 2010, vol. 3, no. 1, str. 193-207. [COBISS.SI-ID 15542105]