UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17)			
Predmet:	Finančna matematika 2		
Course title:	Financial mathematics 2		

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Magistrski študijski program Finančna matematika	ni smeri	1	prvi
Master's study programme Financial Mathematics	none	1	first

Vrsta predmeta / Course type	obvezni / compulsory
Univerzitetna koda predmeta / University course code:	M2515

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike** **študija**	**Samost. delo** **Individ. work**	**ECTS**
45		**30**			**105**	**6**

Nosilec predmeta / Lecturer:	prof. dr. Janez Bernik, doc. dr. Dejan Velušček

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene, angleški / English
	Vaje / Tutorial:	slovenski / Slovene, angleški / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Vpis v letnik študija.	Enrolment in the programme.
Vsebina:	**Content (Syllabus outline):**

Stohastična integracija: Pregled sredstev iz analize, teorije mere in verjetnosti, Brownovo gibanje, martingali v zveznem času, stohastični integral, Itôva formula, stohastične diferencialne enačbe. Vrednotenje izvedenih inštrumentov: Black-Scholesov model, izvedeni inštrumenti, arbitraža in varovanje v splošnem, kompletnost modelov, zamenjava mere in izrek Girsanova, paritetne enakosti. Modeli obrestnih mer: Obveznice in obresti, nekaj klasičnih martingalskih modelov, vrednotenje opcij na obrestne mere. Po potrebi predavatelj v tečaj vključi tudi druge aktualne teme iz novejše znanstvene periodike.	Stochastic integration: Recapitulation of prerequisites from analysis, measure theory and probability, Brownian motion, continuous time martingales, stochastic integral, Itô formula, stochastic differential equations. Pricing of financial derivatives: Black-Merton-Scholes model, derivatives, arbitrage and hedging in general, model completeness, change of measure and Girsanov theorem, parity equations. Interest rate models: Bonds and interest, some classical martingale models, pricing of interest rate options. The lecturer can also include other current topics from recent scientific periodicals in the course.

Temeljni literatura in viri / Readings:

T. Björk: Arbitrage Theory in Continuous Time, 2nd edition, Oxford Univ. Press, Oxford, 2004.

S. E. Shreve: Stochastic Calculus for Finance II: Continuous-Time Models, Springer, New York, 2004.

D. Lamberton, B. Lapeyre: Introduction to Stochastic Calculus Applied to Finance, Chapman & Hall/CRC, Boca Raton, 2000.

J. C. Hull: Options, Futures, and Other Derivative Securities, 6th edition, Pearson/Prentice Hall, Upper Saddle River NJ, 2006.

B. Øksendal: Stochastic Differential Equations: An Introduction with Applications, 6th edition, Springer, Berlin, 2006.

Cilji in kompetence:	**Objectives and competences:**
Modernejši modeli trga slonijo na stohastičnem računu. Predmet bi najprej predstavil stohastično integracijo do mere, ki je nujno potrebna za razumevanje modelov v finančni matematiki v zveznem času. Stohastične diferencialne enačbe potem omogočajo po eni	Modern market models are based on stochastic calculus. The course starts with a short introduction of stochastic integration which is needed for understanding the continuous time models in financial mathematics. Stochastic

strani sredstvo za modeliranje trgov, obrestnih mer in portfeljev, po drugi strani pa omogočajo njihovo učinkovito obravnavo, ki vodi do problemov optimalnega ustavljanja in stohastične kontrole.	differential equations present on one hand the means for modeling the financial markets, interest rates and portfolios and on the other hand the tool for their efficient study, which leads to optimal stoping problems and to stochastic control theory.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razumevanje matematičnih modelov, ki se uporabljajo v matematičnih financah in sredstev za njihovo obravnavo. Uporaba: Pridobljeno znanje je po eni strani neposredno prenosljivo, po drugi strani pa je izhodišče za kombiniranje matematičnega znanja z ekonomskimi vsebinami. Refleksija: Področje, in s tem posledično predmet, združuje številna znanja iz matematike od linearne algebre, do parcialnih diferencialnih enačb. Prenosljive spretnosti – niso vezane le na en predmet: Pridobljeno znanje je neposredno uporabno v finančnih ustanovah kot so banke in zavarovalnice. Vsebina predmeta tudi pomaga izostriti sposobnost matematičnega modeliranja.	Knowledge and understanding: Understanding of mathematical models, which are used in mathematical finance, and the means for their treatment. Application: The acquired knowledge is both: directly transferable and it also serves as a base for combining mathematical knowledge with economical content. Reflection: The area itself, and hence also the course, combines various mathematical disciplines: from linear algebra to partial differential equations. Transferable skills: The acquired knowledge is directly applicable in financial institutions, e.g. banks, insurance companies... The content of the course contributes to the sharpening of the ability of mathematical modeling.

Metode poučevanja in učenja:	**Learning and teaching methods:**
predavanja, vaje, samostojna seminarska naloga	Lectures, exercises, one's own seminar assignment

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): samostojna seminarska naloga izpit iz vaj (2 kolokvija ali pisni izpit) ustni izpit Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)	 50% 50%	Type (examination, oral, coursework, project): one's own seminar assignment 2 midterm exams instead of written exam, written exam oral exam Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Dejan Velušček:

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]

KLEP, Igor, VELUŠČEK, Dejan. Central extensions of [star]-ordered skew fields. Manuscripta mathematica, ISSN 0025-2611, 2006, vol. 120, no. 4, str. 391-402. [COBISS.SI-ID 14074457]

Janez Bernik:

BERNIK, Janez, MASTNAK, Mitja, RADJAVI, Heydar. Realizing irreducible semigroups and real algebras of compact operators. Journal of mathematical analysis and applications, ISSN 0022-247X. [Print ed.], 2008, vol. 348, no. 2, str. 692-707. [COBISS.SI-ID 14899289]

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]

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]