UČNI NAČRT PREDMETA / COURSE SYLLABUS			
Predmet:	Teorija grafov		
Course title:	Graph theory		

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 ali 2	prvi ali drugi
Master's study programme Financial Mathematics	none	1 or 2	first or second

Vrsta predmeta / Course type	izbirni
Univerzitetna koda predmeta / University course code:	M2213

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. Arjana Žitnik, prof. Primož Potočnik, prof. Riste Škrekovski, prof. Sandi Klavžar

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:**
Vsebina:	**Content (Syllabus outline):**

Prirejanja in faktorji (min-max izreki, neodvisne množice in pokritja, Tuttov izrek o 1-faktorju) Povezanost (struktura 2-povezanih in k-povezanih grafov, dokaz in uporabe Mengerjevih izrekov) Barvanja grafov (meje, dokaz Brooksovega izreka, struktura k-kromatičnih grafov, Turanov izrek, kromatični polinom, tetivni grafi) Ravninski grafi (dualni graf, izrek Kuratowskega, konveksne vložiitve, barvanja ravninskih grafov, prekrižno število) Predavatelj izbere še eno izmed naslednjih tem: barvanja povezav in graf povezav, hamiltonski grafi, popolni grafi, ekstremalni problemi, dominacija v grafih, simetrijske lastnosti grafov II.	Matchings and factors (min-max theorem, independent sets and coverings, Tutte's 1-factor theorem) Graph connectvity (structure of 2-connected and k-connected graphs, Menger theorem and its applications) Graph colorings (bounds of the chromatic number, structure of k-chromatic graphs, Turan's theorem, chromatical polynomial, chordal graphs) Planar graphs (dual graph, Kuratowski's theorem, convex embedding, colorings of planar graphs, crossing number) Instructor chooses an addition topic from the following list: edge colorings and line graphs, Hamiltonian graphs, perfect graphs, extremal graph problems, graph domination, symmetry properties of graphs II.

Temeljni literatura in viri / Readings:

R. Diestel: Graph Theory, 3. izdaja, Springer, Berlin, 2005.

A. Bondy, U.S.R. Murty: Graph Theory, 2. izdaja, Springer, Berlin, 2008.

D. West: Introduction to Graph Theory, 2. izdaja, Prentice Hall, Upper Saddle River, 2005.

R. J. Wilson, M. Watkins: Uvod v teorijo grafov, DMFA Slovenije, Ljubljana, 1997.

Cilji in kompetence:	**Objectives and competences:**
Študent poglobi in razširi znanje teorije grafov. Spozna uporabnost grafov in omrežij na različnih področjih matematike ter možnosti za njihovo uporabo tudi v drugih vejah znanosti.	Students will deepen and broaden their knowledge of graph theory, and learn about the usefulness of graphs and networks in different areas of mathematics and their potential use in other branches of science.

Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje: Slušatelj poglobi znanje iz teorije grafov. Uporaba: Grafi omogočajo matematično modeliranje različnih pojavov. Slušatelj se seznani z vrsto matematičnih rezultatov, ki opisujejo lastnosti grafov in tako omogočajo matematično analizo modelov, opisanih z grafi. Refleksija: Povezovanje teoretičnih spoznanj s praktičnimi uporabami na primer v optimizaciji in pri programiranju. Sposobnost prepoznavanja problemov, ki jih lahko uspešno opišemo z grafi. Prenosljive spretnosti – niso vezane le na en predmet: Sposobnost opisa problemov iz vsakdanjega življenja s pomočjo matematičnih struktur, še posebej z grafi. Sposobnost uporabe matematičnih orodij za reševanje problemov.	Knowledge and understanding: Students deepen their knowledge of graph theory. Application: Graphs allow mathematical modeling of variety of phenomena. Students learn various mathematical results that describe properties of graphs and thus provide a mathematical analysis of the models described by graphs. Reflection: Integration of theoretical knowledge with practical applications such as optimization and programming. Ability to recognize problems that can be successfully described by graphs. Transferable skills: The ability to describe practical problems with the help of mathematical structures, in particular with graphs. The ability to use mathematical tools to solve problems.

Metode poučevanja in učenja:	**Learning and teaching methods:**
predavanja, vaje, domače naloge, konzultacije	lectures, exercises, homeworks, consultations

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): izpit iz vaj (pisni izpit) ustni izpit Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)	 50% 50%	Type (examination, oral, coursework, project): written exam oral exam Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Sandi Klavžar:

– KLAVŽAR, Sandi. On the canonical metric representation, average distance, and partial Hamming graphs. European journal of combinatorics, ISSN 0195-6698, 2006, vol. 27, no. 1, str. 68-73 [COBISS.SI-ID 13858905]

– BREŠAR, Boštjan, KLAVŽAR, Sandi, RALL, Douglas. Domination game and an imagination strategy. SIAM journal on discrete mathematics, ISSN 0895-4801, 2010, vol. 24, no. 3, str. 979-991 [COBISS.SI-ID 15648089]

– KLAVŽAR, Sandi, SHPECTOROV, Sergey. Convex excess in partial cubes. Journal of graph theory, ISSN 0364-9024, 2012, vol. 69, no. 4, str. 356-369 [COBISS.SI-ID 16243033]

Primož Potočnik:

– POTOČNIK, Primož. Edge-colourings of cubic graphs admitting a solvable vertex-transitive group of automorphisms. Journal of combinatorial theory. Series B, ISSN 0095-8956, 2004, vol. 91, no. 2, str. 289-300 [COBISS.SI-ID 13087321]

– POTOČNIK, Primož, SPIGA, Pablo, VERRET, Gabriel. Cubic vertex-transitive graphs on up to 1280 vertices. Journal of symbolic computation, ISSN 0747-7171, 2013, vol. 50, str. 465-477 [COBISS.SI-ID 16520537]

– POTOČNIK, Primož. Tetravalent arc-transitive locally-Klein graphs with long consistent cycles. European journal of combinatorics, ISSN 0195-6698, 2014, vol. 36, str. 270-281 [COBISS.SI-ID 16862041]

Riste Škrekovski:

– KAISER, Tomáš, STEHLÍK, Matěj, ŠKREKOVSKI, Riste. On the 2-resonance of fullerenes. SIAM journal on discrete mathematics, ISSN 0895-4801, 2011, vol. 25, no. 4, str. 1737-1745 [COBISS.SI-ID 16244569]

– GOVORČIN, Jelena, KNOR, Martin, ŠKREKOVSKI, Riste. Line graph operation and small worlds.

Information processing letters, ISSN 0020-0190. [Print ed.], 2013, vol. 113, iss. 5-6, str. 196-200 [COBISS.SI-ID 16561497]

– DVOŘÁK, Zdeněk, LIDICKÝ, Bernard, ŠKREKOVSKI, Riste. Randić index and the diameter of a graph. European journal of combinatorics, ISSN 0195-6698, 2011, vol. 32, iss. 3, str. 434-442 [COBISS.SI-ID 17410905]

Arjana Žitnik:

– JURIŠIĆ, Aleksandar, TERWILLIGER, Paul, ŽITNIK, Arjana. The Q-polynomial idempotents of a distance-regular graph. Journal of combinatorial theory. Series B, ISSN 0095-8956, 2010, vol. 100, iss. 6, str. 683-690 [COBISS.SI-ID 15688537]

– ŽITNIK, Arjana, HORVAT, Boris, PISANSKI, Tomaž. All generalized Petersen graphs are unit-distance graphs. Journal of the Korean Mathematical Society, ISSN 0304-9914, 2012, vol. 49, no. 3, str. 475-491 [COBISS.SI-ID 16217945]

– MILANIČ, Martin, PISANSKI, Tomaž, ŽITNIK, Arjana. Dilation coefficient, plane-width, and resolution coefficient of graphs. Monatshefte für Mathematik, ISSN 0026-9255, 2013, vol. 170, no. 2, str. 179-193 [COBISS.SI-ID 1024499540]