UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2017/18)			
Predmet:	Algebraična topologija 2		
Course title:	Algebraic topology 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 ali 2	prvi ali drugi
Master's study programme Financial Mathematics	none	1 or 2	first or second

Vrsta predmeta / Course type	izbirni / elective
Univerzitetna koda predmeta / University course code:	M2311

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike** **študija**	**Samost. delo** **Individ. work**	**ECTS**
30	**15**	**30**			**105**	**6**

Nosilec predmeta / Lecturer:	prof. dr. Janez Mrčun, prof. dr. Petar Pavešić, prof. dr. Dušan Repovš, prof. dr. Sašo Strle

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):**

Kohomološke grupe, izrek o univerzalnih koeficientih. Kohomološki kolobar. Čechova kohomologija. Orientacija mnogoterosti, izreki o dualnosti (Poincare - Lefschetz, Alexander). Künnethov izrek, Bocksteinov homomorphism, transfer, kohomologija grup. Homotopske grupe, eksaktna zaporedja para in vlaknenja, Whiteheadov izrek, homotopski izrez. Hurewiczev izrek. Abstraktna homotopska teorija (H- in koH-prostori, Puppejeva zaporedja, spektri).	Cohomology groups, universal coefficients theorem. Cohomology ring. Čech cohomology. Orientation on manifolds, duality (Poincare - Lefschetz, Alexander). Künneth theorem, Bockstein homomorphism, transfer, group cohomology. Homotopy groups, exact sequence of a pair and of a fibration, Whitehead theorem, homotopy excision. Hurewicz theorem. Abstract homotopy theory (H- and coH-spaces, Puppe sequences, spectra).

Temeljni literatura in viri / Readings:

A. Hatcher: Algebraic Topology, Ch. 3-4.

W.Massey: A Basic Course in Algebraic Topology, Ch. XiI-XV.

E. Spanier: Algebraic Topology, Ch. 5-7.

Dodatna:

A. Dold: Lectures on Algebraic Topology, Ch. 7-8.

P. May, A Concise Course in Algebraic Topology

J. Munkres: Elements of Algebraic Topology, Ch. 5-8.

R. Switzer: Algebraic Topology – Homotopy and Homology

Cilji in kompetence:	**Objectives and competences:**
Študent spozna osnovne pojme algebraične topologije kot so homotopija, celični prostori, homotopske grupe in kohomološke grupe.	Student learns basic concepts of algebraic topology: homotopy, cellular spaces, homotopy groups and cohomology groups.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Poznavanje osnovnih pojmov in tehnik za delo s homotopskimi in kohomološkimi grupami.	Knowledge and understanding: Basic concepts and techniques for the computation of homotopy and cohomology

Razumevanje homotopske invariance in prijemov za obravnavanje geometrijskih vprašanj s pomočjo algebre. Uporaba: V področjih matematike, ki delajo z geometričnimi objekti (kompleksna in globalna analiza, dinamični sistemi, geometrijska in diferencialna topologija, teorija grafov), v računalništvu (grafika, prepoznavanje vzorcev, topološka analiza podatkov, robotika), v teoretični fiziki. Refleksija: Razumevanje teorije na podlagi primerov in uporabe. Prenosljive spretnosti – niso vezane le na en predmet: Formulacija problemov v primernem jeziku, reševanje in analiza doseženega na primerih, prepoznavanje algebraičnih struktur v geometriji.	groups. Understanding of the concepts of homotopy invariance and of approaches to geometric problems by algebraic methods. Application: Parts of mathematics with strong geometric content (complex and global analysis, geometric and differential toology, graph theory), computer science (computer graphics, pattern recognition, topological data analysis, robotics), theoretical physics. Reflection: Understanding of theoretical concepts through examples and applications. Transferable skills: Recognition of algebraic structures in geometry, appropriate formulation of 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 ustni izpit	50% 50%	Type (examination, oral, coursework, project): written exam oral exam

Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)		Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Petar Pavešić:

PAVEŠIĆ, Petar. The Hopf invariant one problem, (Podiplomski seminar iz matematike, 23). Ljubljana: Društvo matematikov, fizikov in astronomov Slovenije, 1995. 65 str. ISBN 961-212-050-1. [COBISS.SI-ID 53969664]

PAVEŠIĆ, Petar. Reducibility of self-homotopy equivalences. Proceedings. Section A, Mathematics, ISSN 0308-2105, 2007, vol. 137, iss 2, str. 389-413. [COBISS.SI-ID 14371929]

PAVEŠIĆ, Petar, PICCININI, Renzo A. Fibrations and their classification, (Research and exposition in mathematics, vol. 33). Lemgo: Heldermann, cop. 2013. XIII, 158 str., ilustr. ISBN 978-3-88538-233-1. [COBISS.SI-ID 16616793]

Janez Mrčun:

MOERDIJK, Ieke, MRČUN, Janez. Introduction to foliations and Lie groupoids, (Cambridge studies in advanced mathematics, 91). Cambridge, UK: Cambridge University Press, 2003. IX, 173 str., ilustr. ISBN 0-521-83197-0. [COBISS.SI-ID 12683097]

MOERDIJK, Ieke, MRČUN, Janez. Lie groupoids, sheaves and cohomology. V: EuroSchool PQR2003 on Poisson geometry, deformation quantisation and group representations, Université Libre de Bruxelles, June 13-17, 2003. GUTT, Simone (ur.), RAWNSLEY, John Howard (ur.), STERNHEIMER, Daniel (ur.). Poisson geometry, deformation quantisation and group representations, (London Mathematical Society lecture note series, ISSN 0076-0552, 323). Cambridge [etc.]: Cambridge University Press, cop. 2005, str. 147-272. [COBISS.SI-ID 13657689]

MRČUN, Janez. Topologija, (Izbrana poglavja iz matematike in računalništva, 44). Ljubljana: DMFA - založništvo, 2008. VI, 147 str., ilustr. ISBN 978-961-212-207-2. [COBISS.SI-ID 243021824]

Sašo Strle:

OWENS, Brendan, STRLE, Sašo. A characterisation of the n<1>[oplus]<3> form and applications to rational homology spheres. Mathematical research letters, ISSN 1073-2780, 2006, vol. 13, iss. 2, str. 259-271. [COBISS.SI-ID 13873241]

OWENS, Brendan, STRLE, Sašo. Rational homology spheres and the four-ball genus of knots. Advances in mathematics, ISSN 0001-8708, 2006, vol. 200, iss. 1, str. 196-216. [COBISS.SI-ID 13875033]

STRLE, Sašo. Bounds on genus and geometric intersections from cylindrical end moduli spaces.

Journal of differential geometry, ISSN 0022-040X, 2003, vol. 65, no. 3, str. 469-511. [COBISS.SI-ID 13135193]

Dušan Repovš:

HEGENBARTH, Friedrich, MURANOV, Jurij Vladimirovič, REPOVŠ, Dušan. Browder-Livesay filtrations and the example of Cappell and Shaneson. Milan journal of mathematics, ISSN 1424-9286, 2013, vol. 81, iss. 1, str. 79-97. [COBISS.SI-ID 16619097]

KARIMOV, Umed H., REPOVŠ, Dušan. Examples of cohomology manifolds which are not homologically locally connected. Topology and its Applications, ISSN 0166-8641. [Print ed.], 2008, vol. 155, iss. 11, str. 1169-1174. [COBISS.SI-ID 14678105]

REPOVŠ, Dušan, SKOPENKOV, Mikhail, SPAGGIARI, Fulvia. On the Pontryagin-Steenrod-Wu theorem. Israel journal of mathematics, ISSN 0021-2172, 2005, vol. 145, str. 341-348. [COBISS.SI-ID 13451353]