Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Izbrana poglavja iz topologije**
Course title:	**Selected Topics in Topology**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 2. stopnja		**1. ali 2.**	**1. ali 3.**
Mathematics, 2nd cycle		**1. or 2.**	**1. or 3.**

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

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		**30**			**135**	**7**

Nosilec predmeta / Lecturer:	Iztok BANIČ

Jeziki / Languages:	**Predavanja / Lectures:**	SLOVENSKO/SLOVENIAN
	Vaje / Tutorial:	SLOVENSKO/SLOVENIAN

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Poznavanje splošne topologije.	Knowledge of general topology.

Vsebina:	**Content (Syllabus outline):**
Vsebina predmeta se prilagaja aktualnim potrebam in razvoju. 1. Poglavja iz splošne topologije: - Evklidski prostor. Evklidska topologija. - Uryshnonova lema. Tietzejev razširitveni izrek. - Mnogoterost. Notranja točka. Robna točka. Notranjost. Rob mnogoterosti.	The contents of this subject is adjusted to the current needs and development. 1. Topics from general topology: - Euclidean space. Euclidean topology. - Urysohn lemma. Tietze extension theorem. - Manifold. Internal point. Boundary point. Interior. Boundary of a manifold.

Sklenjena mnogoterost. - Kompaktne mnogoterosti. Povezane mnogoterosti. - Osnovne lastnosti mnogoterosti. Konstrukcije. - Klasifikacija sklenjenih 2-mnogoterosti. 2. Poglavja iz teorije kontinuumov - Kontinuumi. Zgledi kontinuumov. Vgnezdeni preseki. Verige. - Osnovne lastnosti. - Kompozanti. - Posebni primeri kontinuumov. Knasterjev kontinuum, psevdolok, pahljače, grafi. - Hiperprostori. Konvergenca množic. - Inverzna zaporedja. Inverzne limite.	Closed manifold. - Compact manifold. Connected manifold. - Basic properties of manifolds. Constructons. - Classification of closed 2-manifolds. 2. Topics from continuum theory - Continua. Examples of continua. Nested intersections. Chains. - Basic properties - Composants. - Special examples. Knaster continuum, pseudoarc, fans, graphs. - Hyperspaces. Convergence of sets. - Inverse sequences. Inverse limits.

Temeljni literatura in viri / Readings:

J.R.Munkres: Topology: a first course,Englewood Cliffs, NJ, Prentice-Hall, 1975
E.H.Spanier: Algebraic topology, New York (etc.), McGraw-Hill, 1966
S.Lipschutz: Schaum's outline of theory and problems of general topology, New York (etc.), McGraw-Hill, 1965
P.Pavešić, A.Vavpetič: Rešene naloge iz topologije, Ljubljana, Društvo matematikov, fizikov in astronomov Slovenije, 1997
M.Cencelj, D.Repovš: Topologija, Ljubljana, Pedagoška fakulteta, 2001
J. Mrčun: *Topologija.* Izbrana poglavja iz matematike in računalništva 44, Društvo matematikov, fizikov in astronomov - založništvo, Ljubljana, 2008
S .B. Nadler: Continuum theory: an introduction, Marcel Dekker, New York, 1992
A. Illanes, S. B. Nadler: Hyperspaces. Fundamentals and recent advances, Marcel Dekker, Inc., New York, 1999
J. Vrabec: Metrični prostori. Ljubljana: DMFA, 1993.

Cilji in kompetence:	**Objectives and competences:**
Cilj in kompetence tega predmeta so, da študentje usvojijo pojme in metode izbranih poglavij iz topologije (temeljito spoznati klasične izreke evklidskih prostorov; topološke mnogoterosti, njihove lastnosti in konstrukcije; kontinuume in njihove lastnosti; inverzna zaporedja in inverzne limite kontinuumov), in jih spretno uporabljajo pri raziskovalnem delu in nadaljnjem študiju topologije.	The objectives and competences of this course are for students to acquire knowledge of selected topics in topology (to know thoroughly classical theorems of Euclidean spaces; topological manifolds, their properties and constructions; continua and their properties; inverse sequences and inverse limits of continua), and to thoroughly apply it in the further study of topology.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Po zaključku tega predmeta bo študent sposoben • razumeti pojme izbranih poglavij iz topologije. • razložiti in uporabljati izreke izbranih poglavij iz topologije. • za reševanje problemov uporabiti izkušnje iz izbranih poglavij topologije. • razumeti in uporabljati klasične izreke evklidskih prostorov. • obvladati osnovne koncepte topoloških mnogoterosti in se zavedati pomena odprtih množic v mnogoterosti in njihovih lastnosti. • razumeti in uporabljati lastnosti kontinuumov. • razumeti in uporabljati konstrukcijske metode za konstrukcijo novih primerov kontinuumov. Prenosljive/ključne spretnosti in drugi atributi: • Spretnosti komuniciranja: ustni zagovor izpita, pisno izražanje pri pisnem izpitu. • Uporaba informacijske tehnologije: uporaba računala ali računalniških aplikacij pri reševanju problemov. • Reševanje problemov: reševanje problemov s pomočjo metod iz izbranih poglavij iz topologije. • Uporaba znanja pri samostojnem raziskovalnem delu. • Prenos znanja obravnavanih metod na druga področja, predvsem na področja analize, kompleksne analize, teorije grafov, geometrije in topologije.	Knowledge and understanding: On completion of this course the student will be able to • understand concepts of selected topics in topology. • explain and use theorems from selected topics of topology, • apply experience from selected topics in topology for problem solving. • understand concepts of classical theorems of Euclidean spaces and know their applications. • understand concepts of topological manifolds and to be aware of the importance of open sets in manifolds and their properties. • .be able to understand different properties of continua. • be able to understand and implement construction methods for constructions of new examples of continua. Transferable/Key skills and other attributes: • Communication skills: oral exam, manner of expression at written examination. • Use of information technology: use of a calculator or computer applications for problem solving. • Problem solving: problem solving using methods from selected topics in topology. • To apply the knowledge and skills to individual research work. • Knowledge transfer of treated methods into other fields, to analysis, complex analysis, graph theory, geometry and topology.
Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Seminarske vaje	• Lectures • Tutorial

• Individualno delo	• Individual work

Načini ocenjevanja: **Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt): Izpit: Pisni izpit – problemi Ustni izpit – teorija Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. Opravljen pisni izpit – problemi je pogoj za pristop k ustnemu izpitu – teorija. Pisni izpit – problemi se lahko nadomesti z enim testom (sprotne obveznosti).	50% 50%	Type (examination, oral, coursework, project): Exam: Written exam – problems Oral exam – theory Each of the mentioned assessments must be assessed with a passing grade. Passing grade of written exam – problems is required to take the oral exam – theory. Written exam – problems can be repalced with one mid-term test.

Reference nosilca / Lecturer's references:

1. BANIČ, Iztok, ČREPNJAK, Matevž, MERHAR, Matej, MILUTINOVIĆ, Uroš, SOVIČ, Tina. The closed subset theorem for inverse limits with upper semicontinuous bonding functions. Bulletin of the Malaysian Mathematical Society, ISSN 0126-6705, 2019, vol. 42, iss. 3, str. 835-846, doi: 10.1007/s40840-017-0517-5.

2. BANIČ, Iztok, GOODWIN, Simon, LOCKYER, Michael. Extending bonding functions in generalized inverse sequences. Topology and its Applications, ISSN 0166-8641. [Print ed.], March 2019, vol. 254, str. 85-100. https://doi.org/10.1016/j.topol.2018.12.004, doi: 10.1016/j.topol.2018.12.004.

3. BANIČ, Iztok, ČREPNJAK, Matevž. Inverse component cropping sequences and connected inverse limits over intervals. Glasnik matematički. Serija 3, ISSN 0017-095X, 2018, vol. 53, no. 2, str. 371-384. https://web.math.pmf.unizg.hr/glasnik/53.2/53(2)-09.pdf, doi: 10.3336/gm.53.2.09.

4. BANIČ, Iztok, ČREPNJAK, Matevž. Markov pairs, quasi Markov functions and inverse limits. Houston journal of mathematics, ISSN 0362-1588, 2018, vol. 44, no. 2, str. 695-707. https://www.math.uh.edu/~hjm/restricted/pdf44(2)/16banic.pdf.

5. BANIČ, Iztok, ČREPNJAK, Matevž, MERHAR, Matej, MILUTINOVIĆ, Uroš. The (weak) full projection property for inverse limits with upper semicontinuous bonding functions. Mediterranean journal of mathematics, ISSN 1660-5446, Aug. 2018, vol. 15, iss. 4, str. 1-21, doi: 10.1007/s00009-018-1209-6.