UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Topologija**
Course title:	Topology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 1. stopnja		**3.**	**5.**
Mathematics, 1st cycle		**3.**	**5.**

Vrsta predmeta / Course type | obvezni/compulsory |

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	15	45			135	8

Nosilec predmeta / Lecturer: | Iztok BANIČ |

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Prerequisits:

Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno.

Pozitivni oceni pri ustni predstavitvi in pisnem izpitu sta pogoj za pristop k ustnemu izpitu.

Each of the mentioned commitments must be assessed with a passing grade.

Passing grades of the oral presentation and the written exam are required for taking the oral exam.

Vsebina:

Topološki prostori: topologija na množici, diskretna in indiskretna topologija, metrizabilni topološki prostori, zaporedja v topoloških prostorih, baza in podbaza topologije.

Content (Syllabus outline):

Topological spaces: topology on a set, discrete and indiscrete topology, metrizable spaces, sequences in topological spaces, basis and subbasis for a topology.

Osnovne operacije na množicah: zaprtje, notranjost, rob, izolirane točke množice, stekališča množice, odvod množice.	**Basic operations on sets:** closure, interior, boundary, isolated points of a set, limit points of a set, derived set.
Zvezne funkcije: zveznost, zveznost v točki, karakterizacije zveznih funkcij, odprte in zaprte preslikave	**Continuous functions:** continuity, zveznost v točki, karakterizacije zveznih funkcij, odprte in zaprte preslikave
Topološke lastnosti: homeomorfizem, aksiomi števnosti, goste in nikjer goste množice, separacijske lastnosti.	**Topological properties:** homeomorphism, the countability axioms, dense and nowhere dense sets, separation axioms.
Osnovne konstrukcije: inducirane in koinducirane topologije, produkti, vsote, relativna topologija, kvocientni prostori, zlepki.	**Basic constructions:** induced and coinduced topologies, products, sums, relative topology, quotient topology, attaching of spaces.
Povezanost: separacija prostora, povezanost in osnovne lastnosti, povezanost s potmi, komponente (povezanosti s potmi), lokalna povezanost.	**Connectedness:** separation of a space, connectedness and basic properties, path-connectedness, components (path-connected components), local connectedness.
Kompaktnost: odprta pokritja, kompaktni metrični prostori, kompaktnost in osnovne lastnosti, kompaktni Hausdorffovi prostori, kompaktifikacija (z eno točko), lokalna kompaktnost, kontinuumi.	**Compactness:** open covers, compact metric spaces, compactness and basic properties, compact Hausdorff spaces, (one point) compactifications, local compactness, metric continua.
Baireovi prostori: G-delta in F-sigma množice, množice prve in druge kategorije, primeri Baireovih prostorov, Baireov izrek o kategoriji.	**Baire spaces:** G-delta and F-sigma sets, first and second category sets, examples of Baire spaces, Baire category theorem.
Konstrukcije prostorov in preslikav: Teorija kategorij, homotopija, krovni prostori, topološki svežnji.	**Constructions of spaces and mappings:** Category theory, homotopy, covering spaces, topological bundles.

Temeljni literatura in viri / Readings:

J.R.Munkres: Topology: a first course,Englewood Cliffs, NJ, Prentice-Hall, 1975
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

Dodatna literatura/Additional Readings:

J. Dugundji, Topology, Allyn and Bacon, 1966
Hatcher, Algebraic topology. Cambridge University Press, 2002

J. Nagata, Modern dimension theory, Helderman Verlag, 1983

Cilji in kompetence:	Objectives and competences:
Cilj in kompetence tega predmeta so, da študentje usvojijo osnovne pojme in metode topologije, in jih uporabljajo pri nadaljnjem študiju matematike. Cilj je tudi obvladati osnovne tehnike dela s topološkimi prostori.	The objectives and competences of this course are for students to acquire basic knowledge of topology, and to apply it in the study of mathematics. Another objective is for students to learn how to use the basic techniques of work with topological spaces.

Predvideni študijski rezultati:	Intended learning outcomes:
Znanje in razumevanje: Po zaključku tega predmeta bo študent sposoben • razumeti osnovne pojme topologije. • razložiti in uporabljati osnovne izreke topologije in osnovnih tehnik dela s topološkimi prostori. • za reševanje problemov uporabiti topologijo. 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 topologije (topologija, posebej v obliki pojma zveznosti, je prisotna pri večini drugih matematičnih predmetov).	Knowledge and understanding: On completion of this course the student will be able to • understand basic concepts of topology. • explain and use basic theorems from topology and to use the basic techniques of work with topological spaces, • apply topology for problem solving. 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 topology (topology, especially in the form of continuity, is present in most other mathematical subjects).

Metode poučevanja in učenja:	Learning and teaching methods:
• Predavanja • Teoretične vaje • Seminar	• Lectures • Theoretical exercises • Seminar

Načini ocenjevanja: **Assessment:**

	Delež (v %) /	

	Weight (in %)	
<u>Ustni izpit</u> <u>Pisni izpit</u> Ustna predstavitev	40% 40% 20%	<u>Oral exam</u> <u>Written exam</u> <u>Oral presentation</u>

Opombe:

Pisni izpit se lahko nadomesti s kolokviji v enakem deležu 40%.

Comments:

Written exam can be replaced by written midterm examination in the weight of 40%.

Reference nosilca / Lecturer's references:

1. BANIČ, Iztok, ERCEG, Goran, KENNEDY, Judy A., MOURON, Christopher, NALL, Van. Transitive mappings on the Cantor fan. Ergodic theory & dynamical systems. 2025, 35 str. ISSN 0143-3857. https://doi.org/10.1017/etds.2025.6, DOI: 10.1017/etds.2025.6.

2. BANIČ, Iztok, ERCEG, Goran, KENNEDY, Judy A., MOURON, Christopher, NALL, Van. Chaos and mixing homeomorphisms on fans. Journal of difference equations and applications. 2025, vol. 31, no. 1, 31 str. ISSN 1023-6198. Digitalna knjižnica Univerze v Mariboru – DKUM, DOI: 10.1080/10236198.2024.2384947, DOI: 20.500.12556/DKUM-90072.

3. BANIČ, Iztok, ERCEG, Goran, KENNEDY, Judy A. An embedding of the Cantor fan into the Lelek fan. Rad Hrvatske akademije znanosti i umjetnosti. Razred za matematičke, fizičke i kemijske znanosti. Matematičke znanosti. 2025, vol. 29 = 564, str. 221-229. ISSN 1845-4100. https://doi.org/10.21857/m8vqrt3lk9, Digitalna knjižnica Univerze v Mariboru – DKUM, DOI: 10.21857/m8vqrt3lk9, DOI: 20.500.12556/DKUM-91938.

4. BANIČ, Iztok, GRIL ROGINA, Rene, KENNEDY, Judy A., NALL, Van. Sufficient conditions for non-zero entropy of closed relations. Ergodic theory & dynamical systems. Nov. 2024, vol. 44, iss. 11, str. 3091-3119. ISSN 0143-3857. DOI: 10.1017/etds.2024.11.

5. BANIČ, Iztok, ČREPNJAK, Matevž, KAC, Teja. Markov set-valued functions on compact metric spaces. Glasnik matematički. Serija 3. 2024, vol. 59, no. 1, str. 193-212. ISSN 0017-095X. https://web.math.pmf.unizg.hr/glasnik/59.1/59(1)-09.pdf, DOI: 10.3336/gm.59.1.09.