



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	<b>Algebrska topologija</b>
<b>Course title:</b>	<b>Algebraic Topology</b>

<b>Študijski program in stopnja</b> Study programme and level	<b>Študijska smer</b> Study field	<b>Letnik</b> Academic year	<b>Semester</b> Semester
Matematika, 2. stopnja	Modul R1	<b>1. ali 2.</b>	<b>1. ali 3.</b>
Mathematics, 2 <sup>nd</sup> cycle	Module R1	<b>1. or 2.</b>	<b>1. or 3.</b>

**Vrsta predmeta / Course type**

**Univerzitetna koda predmeta / University course code:**

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

**Nosilec predmeta / Lecturer:**

<b>Jeziki / Languages:</b>	<b>Predavanja / Lectures:</b>	SLOVENSKO/SLOVENE
	<b>Vaje / Tutorial:</b>	SLOVENSKO/SLOVENE

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

Poznavanje algebrskih struktur in topologije.

**Prerequisites:**

Knowledge of algebraic structures and topology..

**Vsebina:**

Kategorije in funktorji. Izomorfizmi. Homotopija, homotopska kategorija topoloških prostorov.  
Funktor fundamentalne grupe. Krovni prostori. Primeri uporabe.  
Simplicialni kompleksi in poliedri. Funktor simplicialne homologije. Eulerjeva karakteristika, Bettijeva števila. Osnove homološke algebre. Druge homološke teorije.

**Content (Syllabus outline):**

Categories and functors. Isomorphisms. Homotopy, homotopy theory of topological spaces.  
The fundamental group functor. Covering spaces. Examples.  
Simplicial complexes and polyhedra. The simplicial homology functor. Euler characteristic, Betti numbers. Fundamentals of homological algebra. Other homology theories.

**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  
 M.Cencelj: Simplicialni kompleksi in simplicialna homologija, Ljubljana, Pedagoška fakulteta, 1996

**Cilji in kompetence:**

Obvladati osnovne tehnike dela s funkciji algebrske topologije.

**Objectives and competences:**

Students learn how to use the basic techniques of work with algebraic topology functors.

**Predvideni študijski rezultati:**

Znanje in razumevanje:

- Uporaba kategorij in funktojev.
- Sposobnost uporabe osnovnih tehnik dela s konkretnimi funkciji algebrske topologije.

Prenosljive/ključne spretnosti in drugi atributi:

- Algebrska topologija je področje, ki povezuje algebro in topologijo. Je močan aparat, ki se ga da uporabiti pri reševanju zelo različnih problemov.

**Intended learning outcomes:**

Knowledge and Understanding:

- The use of categories and functors.
- Be able to use the basic techniques of work with specific algebraic topology functors.

Transferable/Key Skills and other attributes:

- Algebraic topology connects algebra and topology. It is a powerful apparatus that can be used in solving of many different problems

**Metode poučevanja in učenja:**

- Predavanja
- Seminarske vaje

**Learning and teaching methods:**

- Lectures
- Tutorial

**Načini ocenjevanja:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Izpit:

Pisni izpit – problemi  
 Ustni izpit – teorija

Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.

Positivna ocena pri pisnem izpitu - problemi je pogoj za pristop k ustnemu izpitu – teorija.

Delež (v %) /  
 Weight (in %)

50%  
 50%

**Assessment:**

Type (examination, oral, coursework, project):

Exams:

Written exam – problems  
 Oral exam – theory

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

Passing grade of the written exam – problems is required for taking the oral exam – theory.

Pisni izpit – problemi se lahko nadomesti z dvema delnima testoma (ki sta sprotni obveznosti).

Written exam – problems can be replaced by two mid-term tests.

**Reference nosilca / Lecturer's references:**

1. BANIČ, Iztok, ČREPNIJAK, 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](https://doi.org/10.1007/s40840-017-0517-5). [COBISS.SI-ID [23281928](https://www.cobiss.si/id/23281928)].

2. BANIČ, Iztok, ČREPNIJAK, 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](https://doi.org/10.1007/s00009-018-1209-6). [COBISS.SI-ID [23960328](https://www.cobiss.si/id/23960328)].

3. BANIČ, Iztok, ČREPNIJAK, Matevž, MERHAR, Matej, MILUTINOVIĆ, Uroš, SOVIČ, Tina. An Anderson-Choquet-type theorem and a characterization of weakly chainable continua. *Mediterranean journal of mathematics*, ISSN 1660-5446, 2017, vol. 14, iss. 2, str. 1-14, doi: [10.1007/s00009-017-0868-z](https://doi.org/10.1007/s00009-017-0868-z). [COBISS.SI-ID [22997512](https://www.cobiss.si/id/22997512)]

4. BANIČ, Iztok, ČREPNIJAK, Matevž, ERCEG, Goran, MERHAR, Matej, MILUTINOVIĆ, Uroš. Inducing functions between inverse limits with upper semicontinuous bonding functions. *Houston journal of mathematics*, ISSN 0362-1588, 2015, vol. 41, no. 3, str. 1021-1037. [COBISS.SI-ID [21550856](https://www.cobiss.si/id/21550856)]

5. BANIČ, Iztok, ČREPNIJAK, Matevž, MERHAR, Matej, MILUTINOVIĆ, Uroš. Inverse limits, inverse limit hulls and crossovers. *Topology and its Applications*, ISSN 0166-8641. [Print ed.], 2015, vol. 196, str. 155-172, doi: [10.1016/j.topol.2015.09.040](https://doi.org/10.1016/j.topol.2015.09.040). [COBISS.SI-ID [21615112](https://www.cobiss.si/id/21615112)]