



Fakulteta za naravoslovje  
in matematiko

| UČNI NAČRT PREDMETA / COURSE SYLLABUS   |                           |                                      |                                     |  |                                      |             |
|---|---------------------------|--------------------------------------|-------------------------------------|--|--------------------------------------|-------------|
| <b>Predmet:</b>   |                           | <b>Teorija grup</b>                  |                                     |  |                                      |             |
| <b>Course title:</b>  |                           | <b>Group Theory</b>                  |                                     |  |                                      |             |
| <b>Študijski program in stopnja</b><br>Study programme and level  |                           | <b>Študijska smer</b><br>Study field |                                     | <b>Letnik</b><br>Academic year   | <b>Semester</b><br>Semester          |             |
| Matematika, 2. stopnja  |                           | Modul R2                             |                                     | 1. ali 2.  | 1. ali 3.                            |             |
| Mathematics, 2 <sup>nd</sup> cycle  |                           | Module R2                            |                                     | 1. or 2.   | 1. or 3.                             |             |
| <b>Vrsta predmeta / Course type</b>   |                           |                                      |                                     | obvezni / compulsory   |                                      |             |
| <b>Univerzitetna koda predmeta / University course code:</b>  |                           |                                      |                                     |  |                                      |             |
| <b>Predavanja</b><br>Lectures   | <b>Seminar</b><br>Seminar | <b>Sem. vaje</b><br>Tutorial         | <b>Lab. vaje</b><br>Laboratory work | <b>Teren. vaje</b><br>Field work   | <b>Samost. delo</b><br>Individ. work | <b>ECTS</b> |
| 45  |                           | 30                                   |                                     |  | 135                                  | 7           |
| <b>Nosilec predmeta / Lecturer:</b>   |                           | Mateja GRAŠIČ                        |                                     |  |                                      |             |
| <b>Jeziki / Languages:</b>  |                           | <b>Predavanja / Lectures:</b>        |                                     | SLOVENSKO/SLOVENE  |                                      |             |
|   |                           | <b>Vaje / Tutorial:</b>              |                                     | SLOVENSKO/SLOVENE  |                                      |             |
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>  |                           |                                      |                                     | <b>Prerequisites:</b>  |                                      |             |
| Ne.   |                           |                                      |                                     | None.  |                                      |             |
| <b>Vsebina:</b>   |                           |                                      |                                     | <b>Content (Syllabus outline):</b>   |                                      |             |
| Simetrične grupe. Konjugirani elementi in podgrupe. Delovanje grupe na množico. Linearne grupe: osnovne lastnosti in primeri. |                           |                                      |                                     | Symetric groups. Conjugated elements and subgroups. The action of a group on a set. Linear groups: main properties and examples. |                                      |             |
| Izreki Sylowa. Podajanje grupe z generatorji in relacijami. Direktni produkt grup. Abelove grupe.                             |                           |                                      |                                     | Sylow's theorems. Definition of a group by generators and relations. Direct product of groups. Abelian groups.                   |                                      |             |
| Enostavne grupe. Komutant grupe, rešljivost končnih p-grup in grupe zgornje trikotnih   |                           |                                      |                                     | Simple groups. Derived group, solvability of finite p-groups and the group of upper triangular                                   |                                      |             |

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| matrik.                                    | matrices.   |
| Upodobitve grup: osnovni pojmi in primeri. | Representations of groups: concepts and examples. |

### Temeljni literatura in viri / Readings:

W. Y. Gilbert, W. K. Nicholson, Modern Algebra with Applications, Wiley, Chichester 2004  
 S. Lang, Undergraduate Algebra, Springer, 2005  
 J. F. Humphreys, A Course in Group Theory, Oxford University Press, 1997  
 I. Vidav, Algebra, DMFA, Ljubljana 1980

### Cilji in kompetence:

Študentje poglobijo znanje osnove teorije grup in njihovih upodobitev.

### Objectives and competences:

Students deepen the knowledge of the basic concepts of the theory of groups and their representations.

### Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje osnov teorije grup in njihovih upodobitev.
- Poznavanje osnovnih značilnosti in tipičnih primerov grup.

Prenesljive/ključne spretnosti in drugi atributi:

- Pridobljena znanja prispevajo k razumevanju ostalih predmetov s področja algebre, geometrije in topologije.

### Intended learning outcomes:

Knowledge and Understanding:

- To understand the main concepts of groups and their representations.
- To recognize the typical properties and main examples of groups.

Transferable/Key Skills and other attributes:

- The obtained knowledge contributes to better understanding of other subjects in fields of algebra, geometry and topology.

### Metode poučevanja in učenja:

- Predavanja
- Seminarske vaje

### Learning and teaching methods:

- Lectures
- Tutorial

### Načini ocenjevanja:

### Assessment:

|  |                                |  |
|--|--------------------------------|--|
| Način (pisni izpit, ustno izpraševanje, naloge, projekt):                                    | Delež (v %) /<br>Weight (in %) | Type (examination, oral, coursework, project):   |
| Pisni izpit – praktični del<br>Ustni izpit – teoretični del                                  | 50%<br>50%                     | Written exam – practical part<br>Oral exam – theoretical part                          |
| Pisni izpit – praktični del se lahko nadomesti z dvema delnima testoma (sprotni obveznosti). |                                | Written exam – practical part can be replaced by two partial tests (mid-term testing). |
| Vsaka izmed naštetih obveznosti mora   |                                | Each of the mentioned commitments  |

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| <p>biti opravljena s pozitivno oceno.</p> <p>Opravljen pisni del izpita je pogoj za pristop k teoretičnem delu izpita.</p> |  | <p>must be assessed with a passing grade.</p> <p>Passing grade of the written exam is required for taking the oral exam.</p> |
|--|--|--|

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

1. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Jordan  $\{g,h\}$ -derivations of unital algebras. *Operators and matrices*. 2022, vol. 16, no. 2, str. 415-428. ISSN 1846-3886. <http://oam.ele-math.com/16-32/Jordan-g,h-derivations-of-unital-algebras>, DOI: [10.7153/oam-2022-16-32](https://doi.org/10.7153/oam-2022-16-32). [COBISS.SI-ID [114972163](https://cobiss.si/id/114972163)]
2. XIA, Yong-Hui, GRAŠIČ, Mateja, HUANG, Wentao, ROMANOVSKI, Valery. Limit cycles in a model of olfactory sensory neurons. *International journal of bifurcation and chaos in applied sciences and engineering*. 2019, vol. 29, no. 3, str. 1950038-1-1950038-9. ISSN 0218-1274. DOI: [10.1142/S021812741950038X](https://doi.org/10.1142/S021812741950038X). [COBISS.SI-ID [22250006](https://cobiss.si/id/22250006)]
3. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Generalized skew derivations on triangular algebras determined by action on zero products. *Communications in algebra*. 2018, vol. 46, iss. 5, str. 1859-1867. ISSN 0092-7872. <https://doi.org/10.1080/00927872.2017.1360334>, DOI: [10.1080/00927872.2017.1360334](https://doi.org/10.1080/00927872.2017.1360334). [COBISS.SI-ID [18505817](https://cobiss.si/id/18505817)]