Univerza v Mariboru
University of Maribor

Fakulteta za naravoslovje in matematiko / Faculty of Natural Sciences and Mathematics

**OPIS PREDMETA / SUBJECT SPECIFICATION**

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| **Predmet:** | **Metode znanstvenoraziskovalnega dela v biologiji** |
| **Subject Title:** | **Methods of Scientific Research in Biology** |

| Študijski program<br>Study programme | Študijska smer<br>Study field | Letnik<br>Year | Semester<br>Semester |
|---|---|---|---|
| Biologija in ekologija z naravovarstvom /Biology and Ecology with Nature Conservation | Biologija in ekologija z naravovarstvom /Biology and ecology with nature conservation | 1 | 1 |

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

| Predavanja<br>Lectures | Seminar<br>Seminar | Sem. vaje<br>Tutorial | Lab. vaje<br>Lab. work | Teren. vaje<br>Field work | Samost. delo<br>Individ. work | ECTS |
|---|---|---|---|---|---|---|
| 30 | 30 | | 30 | | 90 | 6 |

**Nosilec predmeta / Lecturer:** Dušan DEVETAK

**Jeziki / Languages:**
**Predavanja / Lecture:** slovenski / Slovenian
**Vaje / Tutorial:** slovenski / Slovenian

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

**Prerequisites:**

**Vsebina:**

- Metode znanstveno-raziskovalnega dela v biologiji in ekologiji so vsebinsko ciljno zasnovane glede na predvideno usmeritev posamezne/ga študenta/tke in obsegajo predstavitev temeljnih raziskovalnih metod v biologiji in ekologiji, ter pregled podrobne metodologije, ki jo bo študent/ka uporabil/a pri svojem raziskovalnem delu.
- Glede na vsebinsko usmeritev študenta/ke so selektivno obravnavane metode in tehnike z naslednjih področij: svetlobna in elektronska mikroskopija, citologija in histologija, izbrana biokemijska, biometrijska, fiziološka ter ekološka področja.
- "Izbrane tehnike izolacije in

**Contents (Syllabus outline):**

- Methods of scientific research in biology are based upon the prospective individual student research. They are dealing with the selected themas on general research methods, and with an overview of the special methodologies in use by a studient during his/her research work.
- In accordance with the selected scientific field of investigation, the consideration of methods is focused on the following areas: light and electron microscopy, cytology and histology, and selected domains of biochemistry, biometry, phisiology and ecology.
- The chapter "Selected techniques for isolation and identification of natural substances" includes the presentation of the equipment and chemicals used in protein gel plate and colon chromatography, and the protein analysis using photospectrometry and electrophoresis.
- The use of thin layer cromatography with a chemical and fluorescent detection is discussed in the context with the isolation and dentification of lipids and animal pigments.

identifikacije naravnih substanc" obsegajo predstavitev aparatur, pripomočkov in kemikalij za izolacijo proteinov z gelsko in ionsko izmenjevalno kromatografijo ter njihovo analizo s pomočjo fotospektrometrije in elektroforeze.

- Izolacija in identifikacija lipidov in živalskih pigmentov s tankoplastno kromatografijo in s kemijsko in fluorescenčno detekcijo.
- Izbrane metode v morfometriji in statistična analiza enorazsežnih spremenljivk.
- Geometrijske morfometrične metode in statistična analiza dvorazsežnih spremenljivk.
- ”Izbrane metode v nevrofiziologiji” ter ”Bioakustične meritve in analiza” so tematsko prirejeni pregledi metod in tehnik.
- Metode vzorčenja in numerične analize biodiverzitete (favne, flore in vegetacije).
- Morfološke metode na nivoju osebka obsegajo standardno zajemanje in obdelavo biometrijskih podatkov različnih vegetativnih, reproduktivnih in drugih znakov osebkov.
- ”Izbrane metode v ekologiji” so pregledna obravnava standardnih metod ekološkega vzorčevanja in obdelave podatkov s poudarkom na terestričnih habitatih.
- Predstavitev metod v fitocenologiji, njena tipološka obravnava na krajinskem nivoju in obdelava v GIS.
- "Izbrane metode iz biotehnologije rastlin" se osredotoča na tehniko rastlinskih tkivnih kultur in njeno uporabo v biotehnologiji.

- Selected methods in morphometry, and statistical analysis of one-dimensional parameters.
- Geometrical morphometrical methods, and statistical analysis of two-dimensional parameters.
- "Selected methods in neurophysiology", and "Bioacoustic recordnigs and analysis" represent an overview of the topic methods and techniques.
- Methods of sampling and numerical ananlysis of biota (fauna, flora and vegetation) are discussed in the chapter of "Biodiversity".
- Morphological methods on the individual level comprehend standard capture and treatment of biometrical data concerning diferent vegetative, reproductive and other traits of the specimens.
- "Selected methods in ecology" is an overview of standard methods of ecological sampling and data treatment, with an emphasis on terrestrial habitats.
- The presentation of methods in phytocoenology, its topological tretise on the landscape-level, and the elaboration in GIS.
- "Selected plant biotechnological techniques" are focuses on plant tissue culture techniques and its use in biotechnology.

**Temeljni študijski viri / Textbooks:**


- Alberts, B., A. Johnson, J. Lewis, M. Raff, K.Roberts, P. Walter, 2002: Molecular biology of the cell, 4th Edition, Garland Science, New York.
- Boulton A. A., G. B. Baker , C. H. Vanderwolf, 1990: Neurophysiological Techniques, I. Basic Methods and Concepts. Humana Press, Totowa.
- Cutler, P., 2003: Protein purification protocols. Humana Press, New York.
- Glauert, A. M., 1988: Practical methods in electron microscopy. North-Holland Publishing Company,

Amsterdam, New York, Oxford.
- Kates, M., 1986: Techniques of lipidology. Elsevier, Amsterdam.
- Krebs, C. J., 1999: Ecological methodology. Addison Wesley, Boston.
- Legendre, R, A. Legendre, 2005: Numerical Ecology. Elsevir. Amsterdam.
- Sokal, R. R., F. J. Rohlf, 1995: Biometry: the principles and practice of statistics in biological research. W. H. Freeman and Com. San Francisco.
- Southwood, T. R. E. & P. A. Henderson, 2000: Ecological methods. Blackwell, Oxford.

| **Cilji:** | **Objectives:** |
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| • Seznanitev s temeljnimi skupinami bioloških in ekoloških raziskovalnih metod in tehnik.<br>• Poglobljeno se seznanijo z metodami z znastvenega področja, na katerem bodo opravili svojo raziskavo.<br>• Študenti se usposobijo za samostojno delo in uporabo ustreznih metod in tehnik na izbranem raziskovalnem področju | • An overview of the basic groups of biological and ecological methods and techniques<br>• Students get knowledge of methods within the topic field of their investigation<br>• Student lern to make an appropriate selection of methods and techniques required in their topic field of investigation |

| **Predvideni študijski rezultati:** | **Intended learning outcomes:** |
|---|---|
| Znanje in razumevanje:<br>• Študent/ka dobi pregled nad temeljnimi skupinami znanstveno-raziskovalnih metod in tehnika v biologiji in ekologiji<br>• Študent/ka se usposobi za uporabo ustreznih raziskovalnih metod in tehnik pri reševanju konkretnih znanstvenih problemov na izbranem področju.<br>Prenesljive/ključne spretnosti in drugi atributi:<br>• Študent/ka se usposobi za ustrezno vzorčevanje oziroma zajemanje podatkov ter izpeljavo konkretnih raziskovalnih metod in tehnik. | Knowledge and Understanding:<br>• Student gets knowledge about the basic groups of research methods and techniques in biology and ecology<br>• Student qualifies for selecting appropriate research methods and techniques, respectively, concerning concrete scientific problems within the topic field of investigation<br>Transferable/Key Skills and other attributes:<br>• Student qualifies to make an appropriate sampling or data capture, respectively, and for carrying out concrete investigation methods and techniques |

| **Metode poučevanja in učenja:** | **Learning and teaching methods:** |
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| • Predavanja<br>• Seminar<br>• Individualno eksperimentalno delo | • Lectures<br>• Seminar<br>• Individual experimental work |

| **Načini ocenjevanja:** | Delež (v %) / Weight (in %) | **Assessment:** |
|---|---|---|
| • Projekt | 100 | Project |

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| ***Materialni pogoji za izvedbo predmeta :*** | ***Material conditions for subject realization*** |
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| • *Multimedijska predavalnica*<br>• *Ustrezni laboratoriji in praktikumi* | • *Lecture hall for multimedia presentation*<br>• *Corresponding laboratories and practicum* |

| ***Obveznosti študentov:*** | ***Students' commitments:*** |
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| *(pisni, ustni izpit, naloge, projekti)* | *(written, oral examination, coursework, projects):* |

| | |
|---|---|
| • Projekt: predstavitev in zagovor izbranih metod in tehnik v okviru predstavitve dispozicije magistrske naloge | • Project: Presentation and defense of the chosen methods and techniques in the course of the MA thesis disposition presentation |