



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Principi programskih jezikov
Subject Title:	Principles of Programming Languages

Študijski program Study programme	Študijska smer Study option	Letnik Year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj		4. ali 5.	8. ali 9.
Five-year master's degree program Subject Teacher		4. ali 5.	8. ali 9.

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Seminarske vaje Tutorial	Laborat. vaje Lab work	Terenske vaje Field work	Samostojno delo Individual work	ECTS
30		2	28		120	6

Nosilec predmeta / Lecturer:

Jeziki / Languages: Predavanja / Lecture:
Vaje / Tutorial:

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

Prerequisites:

Vsebina:

- Uvod v programske jezike: neformalna definicija programskih jezikov, delitve programskih jezikov, kratka zgodovina programskih jezikov.
- Uvod v programski jezik Kotlin.
- Namizne aplikacije.
- Razvoj grafičnega uporabniškega vmesnika z uporabo orodja Jetpack Compose.
- Vrednosti in tipi: delitev tipov, statično in dinamično preverjanje tipov, ekvivalenca tipov, vrste izrazov.
- Pomnilnik: spremenljivka, shranljive vrednosti, življenjska doba spremenljivk,

Content (Syllabus outline):

- Introduction to programming languages: informal definition of programming languages, classification of programming languages, brief history of programming languages.
- Introduction to the programming language Kotlin.
- Desktop applications.
- Developing graphical user interfaces with Jetpack Compose toolkit.
- Values and types: type classification, static and dynamic type checking, type equivalence, kind of expressions.
- Storage: variable, storable values, variable

<p>vrste ukazov, izrazi s stranskimi učinki.</p> <ul style="list-style-type: none"> • Povezovanje: povezljive vrednosti, statični in dinamični doseg, vrste deklaracij, bločni ukazi in bločni izrazi, kvalifikacijski princip. • Abstrakcije: princip abstrakcije, vrste abstrakcij, mehanizmi prenosa parametrov, korespondenčni princip, dosledni in normalni izračun. • Ograjevanje: paketi, abstraktni tipi, objekti in razredi, generični moduli. • Sistemi tipov: monomorfni in polimorfni sistem tipov, vrste polimorfizma. Generiki v programskem jeziku Kotlin. • Objektno usmerjeno programiranje: objekt, razred, meta-razred. Razredni objektno usmerjeni jeziki in prototipni objektno usmerjeni jeziki. • Vrste dedovanja: enkratno/večkratno, razredno/objektno, striktno/nestriktno, urejeno/neurejeno, dinamično/selektivno, običajno/mixin. Vgnezdjeni razredi v programskem jeziku java. • Funkcijsko programiranje: značilnosti funkcijskih jezikov, uvod v programski jezik lisp/haskell. 	<p>lifetime, kind of commands, expressions with side effects.</p> <ul style="list-style-type: none"> • Binding: bindable values, static and dynamic scope, kind of declarations, block commands and block expressions, the qualification principle. • Abstractions: abstraction principle, kind of abstractions, parameter passing mechanisms, the correspondence principle, eager and normal evaluation. • Encapsulation: packages, abstract types, objects and classes, generic modules. • Type systems: monomorphic and polymorphic type systems, kind of polymorphisms. Kotlin generics. • Object-Oriented programming: object, class, meta-class. Class-based object-oriented languages and prototype-based object-oriented languages. • Kinds of inheritance: single/multiple, class-based/object-based, strict/non-strict, ordered/un-ordered, dynamic/selective, ordinary/mixin. Nested Java classes. • Functional programming: characteristics of functional languages, introduction to Lisp/Haskell programming language.
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Temeljni študijski viri / Textbooks:

- K.C. Louden: *Programming Languages: Principles & Practices*, Third Edition, Cenage Learning, 2013.
- P. Sestoft: *Programming Language Concepts*, Springer, Berlin, 2012.
- D. A. Watt: *Programming Language Design Concepts*, John Wiley, Chichester, 2004.

Cilji:

Cilj tega predmeta je razumevanje osnovnih konceptov programskih jezikov in razumeti bistvene razlike med funkcijskim, proceduralnim in objektno usmerjenim programiranjem.

Objectives:

The objective of this course is to understand the basic concepts of programming languages and to understand essential differences between functional, procedural and object-oriented programming.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben

- identificirati slabosti in prednosti posameznega programskega vzorca,
- izbrati primeren programski jezik za rešitev dane naloge,
- razumeti različne koncepte programskih jezikov,
- identificira koncepte programskih jezikov, s pomočjo katerih se bo hitreje naučil novega programskega jezika
- razume osnovne koncepte funkcijskih jezikov
- uporabljati trenutno aktualne objektno usmerjene jezike (Java, Kotlin, idr.)
- izdelati namizno aplikacijo (Compose Desktop)

Prenosljive/ključne spretnosti in drugi atributi:

- *Spretnosti komuniciranja:* ustni zagovor laboratorijskih vaj, pisno izražanje pri pisnem izpitu.
- *Uporaba informacijske tehnologije:* uporaba različnih prevajalnikov in interpreterjev.
- *Reševanje problemov:* načrtovanje in implementacija programov z uporabo različnih programskih vzorcev.

Intended learning outcomes:

Knowledge and understanding:

On completion of this course the student will be able to

- identify shortcomings and advantages of particular programming language,
- select suitable programming language to solve particular problem,
- understand different concepts of programming languages,
- identify concepts of programming languages with the aim of quickly learning a new programming language
- understands basic concepts of functional programming
- use modern object-oriented programming languages (Java, Kotlin, etc.)
- implement a desktop application (Compose Desktop)

Transferable/Key skills and other attributes:

- *Communication skills:* oral lab work defence, manner of expression at written examination.
- *Use of information technology:* use of different compilers and interpreters.
- *Problem solving:* program design and implementation using different programming paradigms.

Metode poučevanja in učenja:

- predavanja,
- laboratorijske vaje,

Teaching and learning methods:

- lectures,
- lab work,

		Delež (v %) / Weight (in %)	Assessment methods:
Načini ocenjevanja:			
Sprotni način		50	Constant assessment methods
<ul style="list-style-type: none"> • laboratorijske vaje, • 1. kolokvij, 		25	
			<ul style="list-style-type: none"> • lab work, • 1st midterm examination,



• 2. kolokvij.	25	• 2nd midterm examination.
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Opomba:

Kolokvija se lahko nadomestita s pisnim izpitom v deležu 50 %.

Note:

The midterm examinations may be replaced by written exam in the weight of 50%.

Reference nosilca / Lecturer's references:

- LEBER, Žiga, ČREPINŠEK, Matej, MERNIK, Marjan, KOSAR, Tomaž. RNGSGLR: generalization of the context-aware scanning architecture for all character-level context-free languages. *Mathematics*, ISSN 2227-7390, July 2022, vol. 10, no. 14, 48 str., doi: 10.3390/math10142436. [COBISS.SI-ID 115277827].
- SLIVNIK, Boštjan, KOVAČEVIĆ, Željko, MERNIK, Marjan, KOSAR, Tomaž. On comprehension of genetic programming solutions : a controlled experiment on semantic inference. *Mathematics*, ISSN 2227-7390, Sep. 2022, vol. 10, iss. 18, str. 1-17, ilustr. <https://www.mdpi.com/2227-7390/10/18/3386>, doi: 10.3390/math10183386. [COBISS.SI-ID 122033411].
- KOSAR, Tomaž, ZHENLI, Lu, MERNIK, Marjan, HORVAT, Marjan, ČREPINŠEK, Matej. A case study on the design and implementation of a platform for hand rehabilitation. *Applied sciences*, ISSN 2076-3417, 2021, vol. 11, iss. 1, str. 1-21, ilustr., doi: 10.3390/app11010389. [COBISS.SI-ID 45500163].
- KOSAR, Tomaž, GABERC, Sašo, CARVER, Jeffrey C., MERNIK, Marjan. Program comprehension of domain-specific and general-purpose languages: replication of a family of experiments using integrated development environments. *Empirical software engineering*, ISSN 1382-3256, 2018, vol. 23, iss. 5, str. 2734-2763, doi: 10.1007/s10664-017-9593-2. [COBISS.SI-ID 21123606]
- KOSAR, Tomaž, BOHRA, Sudev, MERNIK, Marjan. A systematic mapping study driven by the margin of error. *The Journal of Systems and Software*, ISSN 0164-1212. [Print ed.], Oct. 2018, vol. 144, str. 439-449, doi: 10.1016/j.jss.2018.06.078. [COBISS.SI-ID 21580566].