Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	PRINCIPI PROGRAMSKIH JEZIKOV
Course title:	PRINCIPLES OF PROGRAMMING LANGUAGES

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
PREDMETNI UČITELJ Enovit magistrski študijski program druge stopnje	IZOBRAŽEVALNO RAČUNALNIŠTVO	4. ali 5.	8. ali 9.
SUBJECT TEACHER Five-year master's degree program Subject Teacher	EDUCATIONAL COMPUTER SCIENCE		

Vrsta predmeta / Course type	Izbirni / Elective
Univerzitetna koda predmeta / University course code	UR27

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike študija**	**Samost. delo** **Individ. work**	**ECTS**
30	0	30	0	0	120	6

Nosilec predmeta / Lecturer:	TOMAŽ KOSAR

Jeziki / Languages:	**Predavanja / Lectures:**	Slovenščina / Slovene
	Vaje / Tutorial:	Slovenščina / Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Ni pogojev	None

Vsebina:	**Content (Syllabus outline):**
• 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, vrste ukazov, izrazi s stranskimi učinki. • 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. • Funkcijsko programiranje: značilnosti funkcijskih jezikov, uvod v programski jezik lisp/haskell.	• Introduction to programming languages: informal definition of programming languages, classification of programming languages, a 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, and kind of expressions. • Storage: variable, storable values, variable lifetime, kind of commands, expressions with side effects. • 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. • Functional programming: characteristics of functional languages, introduction to Lisp/Haskell programming language.

Temeljna literatura in viri / Readings:

• 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 in kompetence:	**Objectives and competences:**
Cilj tega predmeta je razumevanje osnovnih konceptov programskih jezikov in razumeti bistvene razlike med funkcijskim, proceduralnim in objektno usmerjenim programiranjem	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:	**Intended learning outcomes:**
Znanje in razumevanje: • identificirati slabosti in prednosti posameznega programskega vzorca • izbrati primeren programski jezik za rešitev dane naloge • razumete 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.	Knowledge and understanding: • identify shortcomings and advantages of particular programming language • select suitable programming language to solve particular problem • understands 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 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:	**Learning and teaching methods:**
• predavanja, • laboratorijske vaje.	• lectures, • lab work.

Načini ocenjevanja:	**Assessment:**
Pisni izpit - 50% Laboratorijsko delo - 50%	Written exam - 50% Laboratory work - 50%

Opombe: Pisni izpit se lahko nadomesti s kolokviji v enakem deležu 50 %.
Comments: The exam may be replaced by written midterm examinations in the weight of 50%.

Reference nosilca / Lecturer's references:

• 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. 2021, vol. 11, iss. 1, str. 1-21, ilustr. ISSN 2076-3417. DOI: 10.3390/app11010389. [COBISS.SI-ID 45500163].
• SLIVNIK, Boštjan, KOVAČEVIĆ, Željko, MERNIK, Marjan, KOSAR, Tomaž. On comprehension of genetic programming solutions: a controlled experiment on semantic inference. Mathematics. Sep. 2022, vol. 10, iss. 18, str. 1-17, ilustr. ISSN 2227-7390. https://www.mdpi.com/2227-7390/10/18/3386, DOI: 10.3390/math10183386. [COBISS.SI-ID 122033411].
• KOS, Tomaž, MERNIK, Marjan, KOSAR, Tomaž. Evolution of domain-specific modeling language: an example of an industrial case study on an RT-sequencer. Applied sciences. 28 Nov. 2022, vol. 12, iss. 23, 23 str., ilustr. ISSN 2076-3417. DOI: 10.3390/app122312286. [COBISS.SI-ID 131987715].
• KOSAR, Tomaž, KOVAČEVIĆ, Željko, MERNIK, Marjan, SLIVNIK, Boštjan. The Impact of Code Bloat on Genetic Program Comprehension: Replication of a Controlled Experiment on Semantic Inference. Mathematics. 2023, vol. 11, no. 17, [article no.] 3744, 20 str. ISSN 2227-7390. DOI: 10.3390/math11173744. [COBISS.SI-ID 162943747].
• KOSAR, Tomaž, OSTOJIĆ, Dragana, LIU, Yu David, MERNIK, Marjan. Computer science education in ChatGPT Era: experiences from an experiment in a programming course for novice programmers. Mathematics. 2024, vol. 12, no. 5, [article no.] 629, 22 str. ISSN 2227-7390. DOI: 10.3390/math12050629. [COBISS.SI-ID 187200259].