	UČNI NAČRT PREDMETA/COURSE SYLLABUS
Predmet **Course title**	**Napredni pristopi programiranja** **Advanced Programming Approaches**

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Poslovna ekonomija in upravljanje	Upravljanje in razvoj informacijskih sistemov	2.	3.
Business Economics and Management	Management and Development of Information Systems	2nd	3rd

Vrsta predmeta/Course type izbirni / elective

Univerzitetna koda predmeta/University course code 3_PEU_IP_UN6_URIS

Predavanja **Lectures**	**Seminar** **Seminar**	**Sem. vaje** **Tutorial**	**Lab. vaje** **Laboratory work**	**Teren. vaje** **Field work**	**Samost. delo** **Individ. work**	**ECTS**
15	10				425	15

Nosilec predmeta/Lecturer: doc. dr. Branko Kaučič

Jeziki/ Languages:		
	Predavanja/Lectures:	slovenski/Slovenian
	Vaje/Tutorial:	slovenski/Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
• Pogoj za vključitev v delo je vpis v drugi letnik študijskega programa. • Študent mora pred izpitom pripraviti in predstaviti raziskovalno nalogo.	• The prerequisite for participation is enrolment in the second year of study. • Student has to prepare, present and defend a research paper before the examination.

Vsebina:	**Content (Syllabus outline):**
• *Uvod:* Kratek pregled razvoja programskih jezikov in programiranja, potrebe po naprednih pristopih. • *Višji programski jeziki:* Pregled višjih programskih jezikov, družine in vrste programskih jezikov, gonilo razvoja naprednih pristopov skozi programske jezike. • *Algoritmi in podatkovne strukture:* Kompleksnejši algoritmi, kompleksnejše podatkovne strukture,	• *Introduction*: A brief overview of programming language development and programming, and the requirements for advanced approaches. • *Higher programming languages:* An overview of higher-level programming languages, families and types of programming languages, reasons and needs that influence the development

optimizacija časovne in prostorske zahtevnosti. • *Naprednejše metode in pristopi:* Pregled novejših metod in pristopov, optimizacijski problemi, evolucijski programiranje, verjetnostni algoritmi, ... • *Ogrodja:* Naprednejši pristopi razvoja spletnih aplikacij z uporabo ogrodij. • *Programski inženiring:* Vpliv naprednejših pristopov v menedžmentu projektov, kakovosti programske opreme in arhitekturi programske opreme. • *Dobre prakse naprednega programiranja.*	of advanced approaches within programming languages. • *Algorithms and data structures:* complex algorithms, complex data structures, optimization of time and space complexity. • *Advanced methods and approaches:* An overview of modern methods and approaches, optimization problems, evolutionary programming, genetic programming. • *Frameworks:* Advanced approaches in web applications development through frameworks. • *Software engineering:* The impact of advanced approaches on project management, software quality and software architecture. • *Good practices of advanced programming.*

Literatura in viri/Readings:

Temeljna literatura/Basic literature

- Ingeno, J. (2018). *Software Architect's Handbook: Become a successful software architect by implementing effective architecture concepts*. Packt Publishing Ltd.
- Cormen, T. H., Leiserson, C. E., Rivest, R. L. & Stein, C. (2009). Introduction to Algorithms. The MIT Press
- Okasaki, C. (1999). Purely Functional Data Structures. Cambridge University Press
- Brass, P. (2019). Advanced Data Structures. Cambridge University Press.
- Cormen, T.H. (2013). Algorithms Unlocked. The MIT Press.
- Mernik, M. (2003). Evolucijski algoritmi. Fakulteta za elektrotehniko, računalništvo in informatiko, Inštitut za računalništvo.

Priporočljiva literatura/Recommended literature

- Tilley, S., Rosenblatt, H. J. (2016). *Systems Analysis and Design, 11th Edition.* Cengage Learning.
- Wood, E. (2019). Data Structures and Advanced Algorithms.
- Roughgarden, T. (2017). Algorithms Illuminated: Part 1: The Basics. Soundlikeyourself Publishing.
- Roughgarden, T. (2018). Algorithms Illuminated: Part 2: Graph Algorithms and Data Structures. Soundlikeyourself Publishing.
- Roughgarden, T. (2019). Algorithms Illuminated: Part 3: Greedy Algorithms and Dynamic Programming. Soundlikeyourself Publishing.
- Roughgarden, T. (2020). Algorithms Illuminated: Part 4: Algorithms for NP-Hard Problems. Soundlikeyourself Publishing.
- Kleinberg, J. (2013). Algorithm Design. Pearson India.
- Wengrow, J. (2020). A Common-Sense Guide to Data Structures and Algorithms: Level Up Your Core Programming Skills. Pragmatic Bookshel.

- Louridas, P. (2020). Algorithms (The MIT Press Essential Knowledge series). The MIT Press.
- Heineman, G. T. (2016). Algorithms in a Nutshell: A Practical Guide. O'Reilly Media.
- Ahmad, I. (2020). 40 Algorithms Every Programmer Should Know: Hone your problem-solving skills by learning different algorithms and their implementation in Python. Packt Publishing.

Cilji in kompetence:	Objectives and competences:
Učna enota prispeva predvsem k razvoju naslednjih splošnih in specifičnih kompetenc: • poglobljeno poznavanje teorij in aplikativne razvojno raziskovalne prakse metod in oblik sodobnega programiranja, • usposobljenost za kreativno in samostojno znanstveno raziskovalno in razvojno delo, reševanje zahtevnih in kompleksnih problemov in vodenje raziskovalnih in razvojnih projektov, • usposobljenost za samostojno in timsko raziskovalno in razvojno delo v razvojnih in interdisciplinarnih skupinah, za uporabo znanstvenih pristopov pri delu in za obvladanje sodobnih razvojnih postopkov na področju računalništva in informatike s poudarkom na sodobnih pristopih programiranja, • uporaba modernih orodij in tehnik pri reševanju in predstavitvi problemov sodobnih pristopov programiranja, • usposobljenost za sintezo in interpretacijo v raziskavah pridobljenih podatkov ter prenos znanja v konkretno delovno in znanstveno-raziskovalno okolje.	*The learning unit mainly contributes to the development of the following general and specific competences:* • in-depth knowledge of the theories and applied research and development practices of methods and forms of modern programming, • the ability to engage in creative and independent scientific research and development, to solve demanding and complex problems and to manage research and development projects, • the ability to carry out independent and team-oriented research and development in development and interdisciplinary groups, to apply scientific working methods and to master modern development procedures in the fields of computer science and informatics with a focus on modern programming approaches, • the use of modern tools and techniques in solving and presenting the problems of modern programming approaches, • the ability to synthesize and interpret data obtained in research and to apply knowledge to a specific work and scientific research environment.

Predvideni študijski rezultati:	Intended learning outcomes:
Študent/študentka: • pozna razvoj in trende programskih jezikov in programiranja, • se usposobi za kritično presojo in analizo teoretičnih osnov naprednih pristopov programiranja, • razume pomen različnih razvojnih modelov naprednih pristopov programiranja,	*Students:* • are familiar with the development and trends of programming languages and programming, • are capable of critical evaluation and analysis of the theoretical foundations of advanced programming approaches,

• razvija sposobnosti načrtovanje in izvedbo raziskovalnega dela, analizo in interpretacijo podatkov pomembnih za programerske aktivnosti, programersko etiko in možna tveganja kibernetskega prostora, • razvije sposobnost za reševanje poslovno-informacijskih problemov v povezavi z paradigmami sodobnih programerskih pristopov, • razume pomen metod in oblik sodobnega - naprednega programiranja, • se usposobi za kritično presojo in analizo teoretičnih algoritemskih modelov, metod in oblik sodobnega – naprednega programiranja ter sledenja primerom dobre prakse.	• understand the importance of different development models of advanced programming approaches, • develop the ability to plan and conduct research, analyse and interpret data relevant to programming activities, programming ethics and possible risks of cyberspace, • develop the ability to solve business information problems related to the paradigms of modern programming approaches, • understand the importance of methods and forms of modern - advanced programming, • are trained to critically evaluate and analyse theoretical algorithmic models, methods and forms of modern - advanced programming and follow examples of good practice.

Metode poučevanja in učenja:	Learning and teaching methods:
• predavanja z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov), • projektni seminar, • individualne in skupinske konsultacije (diskusija, dodatna razlaga, obravnava specifičnih vprašanj), • oblikovanje portfolija in samostojen študij (motiviranje, usmerjanje, samoopazovanje, samouravnavanje, refleksija, samoocenjevanje).	• lectures with active student participation (explanation, discussion, questions, examples, problem solving), • project work seminar, • individual and group consultations (discussion, further explanation, addressing specific issues), • designing a portfolio and independent study (motivating, directing, self-observation, self-regulation, reflection, self-assessment).

Načini ocenjevanja:	Delež (v %) Weight (in %)	Assessment:
Načini: • temeljna ali aplikativna raziskovalna naloga z zagovorom (obseg 30.000 znakov). Ocenjevalna lestvica: uspešno, neuspešno.	100 %	Types: • fundamental or applied research paper with defence (30,000 characters). Grading scheme: successful, unsuccessful.