

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Operacijski sistemi
Course title: Operating systems

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Računalništvo in spletne tehnologije, visokošolski strokovni študijski program prve stopnje	-	Prvi	Drugi
Computer Science and Web Technologies, first cycle Professional Study Programme	-	First	Second

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

2-RST-VS-OS-2020-05-14

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	-	45	-	-	105	6

Nosilec predmeta / Lecturer: izr. prof. dr. Biljana Mileva Boshkoska

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian, Angleški / English

Vaje / Tutorial: Slovenski / Slovenian, Angleški / English

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

Pogoj za vključitev v delo je vpis v 1. letnik študija. Pogoj za pristop k izpitu so opravljene vse obveznosti na vajah, zagovor domačih nalog ter priprava in uspešen zagovor seminarske naloge.

Prerequisites:

The prerequisite is enrolment into the first year of the study. Student has to pass all requirements given at the exercises, defend the homeworks, and prepare and defend the seminar work.

Vsebina:

- *Uvod:*
Uvod v operacijske sisteme (OS): vrste in zgodovina OS, osnovne funkcionalnosti OS, koncepti, sistemski klici, strukture OS (arhitekture), primeri pogosteje uporabljenih OS.
- *Procesi:*
Osnovni model procesa, koncepti in lastnosti, izvajanje procesov, medprocesna komunikacija (MPK),

Content (Syllabus outline):

- *Introduction:*
Introduction to operating systems (OS): types and history of OS, basic OS functionalities, concepts, system calls, OS structures (architectures), examples of frequently used computer OSs.
- *Processes:*
Basic process model, concepts and characteristics, implementation of processes, inter-process communication

<p>klasične težave pri MPK, upravljanje s procesi.</p> <ul style="list-style-type: none"> • <i>Programiranje z nitmi:</i> POSIX vmesniki za niti (vključno z nitmi pri Win32 in Javi), skupne spremenljivke, sinhronizacija niti, varnost pri nitih. • <i>Popolni zastoj:</i> Računalniški viri, definicija in pogoji za zastoj; modeliranje zastojev, odkrivanje, izogibanje in preprečevanje zastojev. • <i>Razvrščanje:</i> Večprogramsko okolje, vrste razvrščanja in cilji, razvrščanje v paketnih in interaktivnih sistemih ter sistemih, ki tečejo v realnem času. • <i>Upravljanje s pomnilnikom:</i> Osnovni principi upravljanja s pomnilnikom, menjavanje in upravljanje prostega pomnilnika, virtualni pomnilnik in zamenjava strani, algoritmi za zamenjavo strani, segmentacija. • <i>Datotečni sistem:</i> Definicija, datoteke in imeniki, praktične izvedbe in primeri datotečnih sistemov. • <i>Vhod in izhod (V/I):</i> Načela V/I pri strojni in programski opremi, računalniški diski. 	<p>(IPC), classical IPC problems, process management.</p> <ul style="list-style-type: none"> • <i>Programming with threads:</i> POSIX threads interface (including Win32 and Java threads), shared variables, thread synchronization, thread safety. • <i>Deadlocks:</i> Computer resources, deadlock definition and conditions, modelling deadlocks, detection, avoidance and prevention of deadlocks. • <i>Scheduling:</i> Multi-program environment, scheduling types and goals, scheduling in batch, interactive and real-time systems. • <i>Memory management:</i> Basic memory management, swapping and managing free memory, virtual memory and paging, page replacement algorithms, segmentation. • <i>File sistem:</i> Definition, files and directories, file system implementation and examples. • <i>Input and output (I/O):</i> Principles of I/O in hardware and software, computer disks.
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Temeljni literatura in viri / Readings:

<ul style="list-style-type: none"> • Silberschatz, A., Galvin, P. B. & Gagne, G. (2018). <i>Operating System Concepts</i> (10th ed.). John Wiley & Sons. • Tanenbaum, A. S. (2015). <i>Modern Operating Systems</i> (4th ed.). Prentice Hall. • Zazula, D. (2005). <i>Operacijski sistemi</i>. Maribor: Založniška tiskarska dejavnost tehniških fakultet. • Blum, R. (2015). <i>Linux Command Line and Shell Scripting Bible</i> (3rd ed.). Wiley Publishing, Inc. • Hover, A. (2010). <i>System Programming with C and Unix</i>. Pearson Education. • Prosojnice s predavanj in vaj (dostopne prek https://moodle.fis.unm.si/).
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Cilji in kompetence:

<p><i>Učna enota prispeva k razvoju naslednjih splošnih in predmetno-specifičnih kompetenc:</i></p> <p><i>Splošne kompetence:</i></p> <ul style="list-style-type: none"> • poznavanje osnovnih principov modernih operacijskih sistemov • sposobnost praktične uporabe najbolj razširjenih operacijskih sistemov • sposobnost fleksibilne uporabe znanja v praksi
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Objectives and competences:

<p><i>The instructional unit contributes to the development of the following general and subject-specific competences:</i></p> <p><i>General competences:</i></p> <ul style="list-style-type: none"> • familiarity with the basics of principles used in modern operating systems • familiarity with practical usage of most frequently used operating systems • ability to use the acquired knowledge in practice in a flexible manner.

- osnovna znanja potrebna za razvoj aplikacij na različnih operacijskih sistemih

Predmetno-specifične kompetence:

- poznavanje temeljnih algoritmov v operacijskih sistemih
- kodiranje algoritmov za medprocesno komunikacijo v primernem računalniškem okolju

- basic knowledge relevant for application development on various operating systems

Subject-specific competences:

- familiarity with the fundamental algorithms used in operating systems
- ability to code the algorithms for inter-process communications within appropriate software framework

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

- se seznani z osnovnimi zakonitostmi, funkcionalnostmi in koncepti najpogostejših računalniških operacijskih sistemov
- razume kompleksnost MPK in se seznani s problemi, ki jih mora reševati sodoben operacijski sistem
- razume razliko med procesi in nitmi in se seznani z različnimi algoritmi za upravljanje z njimi
- razume potrebo po razvrščanju in se seznani z algoritmi, ki se uporabljajo za razvrščanje v različnih operacijskih sistemih
- razume problematiko in algoritme za upravljanje s pomnilnikom
- razume strukturo datotečnih sistemov
- razume načela V/I strojne in programske opreme

Intended learning outcomes:

Knowledge and understanding:

The student:

- becomes familiar with the basic structure, functionality and concepts of the most frequently used computer operating systems
- understands the complexity of ICP and get familiar with problems that are managed by modern operating system
- understands the difference between processes and threads, and gets familiar with different algorithms for their management
- understands the need of scheduling and gets familiar with the algorithms used for scheduling in different operating systems
- understands the problems and algorithms for memory management
- understands the structure of the file systems
- understands the principles of I/O hardware and software

Metode poučevanja in učenja:

- *predavanja* z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov)
- *vaje*, kjer bodo študentje na konkretnih problemih ponovili, utrdili in dodatno osvetlili pojme in metode, spoznane na predavanjih
- *domače naloge*, s katerimi bodo študentje sproti ponavljali in utrjevali snov
- *seminarska naloga*, kjer bo v okviru samostojnega dela študent preučil določeno vsebinsko področje ali rešil konkreten problem ter ga ustrezno predstavil

Learning and teaching methods:

- *lectures* with active student participation (explanation, discussion, questions, examples, problem solving)
- *tutorials* where students will rehearse, revise and lit up concepts, and methods encountered at lectures
- *homeworks*, that will force students to study and consolidate knowledge continuously
- *seminar work*, is an individual assignment for each student, in order to independently examine a specific subject or solve a specific problem, and present it to the rest of the class

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt): <ul style="list-style-type: none"> • pisni izpit • seminarska naloga in domače naloge 	60 40	Type (examination, oral, coursework, project): <ul style="list-style-type: none"> • written exam • seminar work, homeworks

Reference nosilca / Lecturer's references:

- MILEVABOSHKOSKA, Biljana, BOHANEC, Marko, BOŠKOSKI, Pavle, JURičIĆ, Đani. Copula based decision support system for quality ranking in the manufacturing of electronically commutated motors. *Journal of intelligent manufacturing*, 2015, vol. 26, no. 2, str. 281 – 293.
- MILEVA BOSHKOSKA, Biljana, BOŠKOSKI, Pavle, DEBENJAK, Andrej, JURičIĆ, Đani. Dependence among complex random variables as a fuel cell condition indicator. *Journal of power sources*, jun. 2015, vol. 284, str. 566-573.
- ŠUBELJ, Lovro, BAJEC, Marko, MILEVA BOSHKOSKA, Biljana, KASTRIN, Andrej, LEVNAJIĆ, Zoran. Quantifying the consistency of scientific databases. *PloS one*, 2015, vol. 10, no. 5, str. 116.
- BOŠKOSKI, Pavle, DEBENJAK, Andrej, MILEVA BOSHKOSKA, Biljana. Rayleigh copula for describing impedance data - with application to condition monitoring of proton exchange membrane fuel cells. *European journal of operational research*, ISSN 0377-2217. [Print ed.], 2018, vol. 266, no. 1, str. 269-277, doi: 10.1016/j.ejor.2017.08.058. [COBISS.SI-ID 30736167].
- ZHAO, Guoqing, LIU, Shaofeng, LOPEZ, Carmen, LU, Haiyan, ELGUETA, Sebastian, CHEN, Huilan, MILEVA BOSHKOSKA, Biljana. Blockchain technology in agri-food value chain management : a synthesis of applications, challenges and future research directions. *Computers in industry*, ISSN 0166-3615. [Print ed.], 2019, vol. 109, str. 83-99, doi: 10.1016/j.compind.2019.04.002. [COBISS.SI-ID 32345127].