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
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   UR19

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	0	45	0	0	105	6

Nosilec predmeta / Lecturer: BOŽIDAR POTOČNIK

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

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

Pogojev ni	None

Vsebina:	Content (Syllabus outline):
• Uvod: vloga operacijskega sistema (OS) ter njegove temeljne funkcije, zgradba računalniških sistemov in OS, delo s prekinitvami in z vhodni-izhodnimi napravami. • Upravljanje s posli in procesi: posel in njegovo izvrševanje, zgradba in stanja procesa, procesov nadzorni blok, niti, komunikacija med procesi. • Razvrščanje procesov: kriteriji za razvrščanje, razvrščevalni algoritmi (kdor prej pride, prej melje, najkrajši posli najprej, prioriteta, krožna prioriteta, več aktivnih vrst). • Upravljanje s posli: dvonivojsko in trinivojsko razvrščanje poslov, izločanje procesov. • Sinhronizacija med procesi: kritični odsek, Petersonova rešitev za sinhronizacijo med dvema procesoma, pekarniški algoritem, strojni pripomočki za sinhronizacijo, semafor, monitor, problem popolnega zastoja in pomanjkanja. • Klasični problemi sinhronizacije: proizvajalec in potrošnik, pisci in bralci, filozofi pri kosilu, speči brivec. • Upravljanje s pomnilnikom: particije, ostranjevanje, izvedbe tabel strani, asociativni pomnilnik, segmentiranje, segmentiranje z ostranjevanjem. • Virtualni pomnilnik: postopki nalaganja in zamenjave strani, napaka strani, algoritmi za zamenjavo strani (kdor prej pride, prej melje, optimalni, najdlje neuporabljeni, števni). • Upravljanje z zbirčnim sistemom: kazala in njihova izvedba (večnivojska, drevesna, aciklični grafi), funkcije OS pri delu z zbirkami in kazali, sloji zbirčnega sistema. • Izvedbe zbirčnega sistema: fizični zapisi zbirk v obliki sklenjenega zapisa, kazalčnega seznama in indeksne namestitve, NTFS. • Razvrščanje zahtev za disk: algoritmi (kdor prej pride, prej melje, prebirni, ciklični prebirni, multimedijski), upravljanje s prostim diskovnim prostorom in z odlagalnim prostorom.	• Introduction: role of operating systems (OS) and their basic functionality, computer systems and OS architectures, interrupt handling and access to input/output devices. • Job and process management: jobs and their scheduling, process structure and states, process control block, threads, process communication. • Process scheduling: scheduling criteria, scheduling algorithms (first-come first-served, shortest-job-first, priority, round-robin, several active queues). • Job management: two- and three-level scheduling, process suspension. • Process synchronisation: critical section, Peterson's solution for synchronisation of two processes, bakery algorithm, hardware for synchronisation, semaphore, monitor, the problem of deadlock and starvation. • Classical problems of synchronisation: producer-consumer, readers and writers, dining philosophers, sleeping barber. • Memory management: partitions, paging, page table design, associative registers, segmentation, segmentation with paging. • Virtual memory: loading and replacement algorithms, page fault, page replacement algorithms (first-come first-served, optimal, least-recently-used, counting). • File system management: directories and their implementation (multilevel, tree, acyclic graphs), functions of OS to handle files and directories, levels of file system. • Implementation of file systems: physical allocation of files as contiguous, list of pointers and indexing, NTFS. • Disk scheduling: algorithms (first-come first-served, scan, cyclic scan, multimedia), disk free-space and swap-space management.

Temeljna literatura in viri / Readings:

• D. Zazula: Operacijski sistemi, Univerza v Mariboru, Fakulteta za elektrotehniko, računalništvo in informatiko, Maribor, 2008.
• A. Silberschatz, P. B. Galvin, G. Gagne: Operating System Concepts, Tenth Edition, Wiley, Hoboken, 2018.
• W. Stallings: Operating systems, Ninth Edition, Pearson Education Limited, Essex, 2018.
• A. S. Tanenbaum, H. Bos: Modern Operating Systems, Prentice Hall, Boston, 2014.

Cilji in kompetence:	Objectives and competences:
Cilj tega predmeta je, da bodo študentje razumeli temeljna znanja o zasnovi in delovanju operacijskih sistemov in operacijske sisteme uporabiti v praksi	The objective of this course is for students to be able to understand the basic knowledge of operating systems design and operation and to use operating systems in practice

Predvideni študijski rezultati:	Intended learning outcomes:
Znanje in razumevanje: • razumeti glavne principe načrtovanja in delovanja operacijskih sistemov • analizirati in pouporabiti algoritme za razvrščanje in sinhronizacijo procesov ter za upravljanje s pomnilnikom in z zbirčnimi sistemi • optimalno namestiti operacijski sistem in uporabljati njegove funkcije Prenosljive/ključne spretnosti in drugi atributi: • Spretnosti komuniciranja: ustni zagovor laboratorijskih vaj, pisni izpit. • Uporaba informacijske tehnologije: delo z različnimi operacijskimi sistemi, pisanje krajših sistemskih programov. • Delo v skupini: skupinsko delo pri določenih laboratorijskih vajah. • Reševanje problemov: sodelovanje z industrijskimi partnerji.	Knowledge and understanding: • understand the basic principles of the operating systems design and operation • analyse and reimplement the algorithms for process scheduling and synchronisation, and for memory and filesystem management • install and setup the operating system and use its functions Transferable/Key skills and other attributes: • Communication skills: oral lab work defence, written examination. • Use of information technology: use of different operating systems, implementation of plain system programs. • Team work: team execution of some lab work. • Problem solving: co-operation with industrial partners

Metode poučevanja in učenja: / **Learning and teaching methods:**

Metode poučevanja in učenja:	Learning and teaching methods:
• predavanja, • seminarske vaje, • laboratorijske vaje.	• lectures, • tutorials, • lab work.

Načini ocenjevanja: / **Assessment:**

Načini ocenjevanja:	Assessment:
Računalniško delo - 50% Pisni izpit - 50%	Computer skills - 50% Written exam - 50%

Opombe: Pisni izpit se lahko nadomesti s kolokviji v enakem deležu 50 %.

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

Reference nosilca / Lecturer's references:

• POTOČNIK, Božidar, ŠAVC, Martin. Deeply-supervised 3D convolutional neural networks for automated ovary and follicle detection from ultrasound volumes. Applied sciences. Jan. 2022, vol. 12, iss. 3, 21 str, ilustr. ISSN 2076-3417. DOI: 10.3390/app12031246. [COBISS.SI-ID 94961923].

• POTOČNIK, Božidar, DIVJAK, Matjaž, URH, Filip, FRANČIČ, Aljaž, KRANJEC, Jernej, ŠAVC, Martin, CIKAJLO, Imre, MATJAČIĆ, Zlatko, ZADRAVEC, Matjaž, HOLOBAR, Aleš. Estimation of muscle co-activations in wrist rehabilitation after stroke is sensitive to motor unit distribution and action potential shapes. IEEE transactions on neural systems and rehabilitation engineering. [Print ed.]. May 2020, vol. 28, iss. 5, str. 1208 - 1215, ilustr. ISSN 1534-4320. DOI: 10.1109/TNSRE.2020.2980440. [COBISS.SI-ID 23079958].

• KRAMBERGER, Tin, POTOČNIK, Božidar. LSUN-stanford car dataset : enhancing large-scale car image datasets using deep learning for usage in GAN training. Applied sciences. 2020, vol. 10, iss. 14, str. 1-12, ilustr. ISSN 2076-3417. DOI: 10.3390/app10144913. [COBISS.SI-ID 25296131].

• POTOČNIK, Božidar, MUNDA, Jurij, RELJIČ, Milan, RAKIĆ, Ksenija, KNEZ, Jure, VLAISAVLJEVIĆ, Veljko, SEDEJ, Gašper, CIGALE, Boris, HOLOBAR, Aleš, ZAZULA, Damjan. Public database for validation of follicle detection algorithms on 3D ultrasound images of ovaries. Computer methods and programs in biomedicine. [Print ed.]. Nov. 2020, vol. 196, str. 1-10. ISSN 0169-2607. DOI: 10.1016/j.cmpb.2020.105621. [COBISS.SI-ID 21079811]