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| **University** | TECHNICAL UNIVERSITY OF CIVIL ENGINEERING BUCHAREST | | |
| **Faculty** | HYDROTECHNICS | | |
| **Department** | HYDROTECHNICAL ENGINEERING | | |
| **Position in the staffing table** | Position 14 | | |
| **Teaching position** | UNIVERSITY ASSOCIATE PROFESSOR | | |
| **Subjects in the curriculum** | Operating systems, signals and systems, Computer Programming and Programming Languages II, Computer Architecture, Software Engineeering, Diploma (synthesis + guidance) | | |
| **Scientific field** | Systems Engineering (Automation and Applied Informatics) | | |
| **Job description** | University Associate Professor, position 14 – Department of Hydrotechnical Engineering – Permanent university associate professor position including teaching and research activities specific to the subjects in the curriculum included in the advertised position. | | |
| **Associated duties/ activities** | Teaching activities consist of delivering courses and practical applications in laboratory/seminar/project settings. Didactic preparation includes: Development of teaching manuals; Development of other modern laboratory guidance supports necessary for the educational process. Other activities included in the teaching duties: Support activities for exams for the subjects in the curriculum included in the advertised position; Checking papers and projects; Consultations for the subjects in the curriculum included in the advertised position; Supervision of graduation papers. Scientific research in the field of Systems Engineering and related fields. | | |
| **Minimum salary** |  | | |
| **Competition schedule** | ***Published on the website www.utcb.ro*** | | |
| **Date of announcement publication in the official gazette** | ***M.O. Part III No. 143/30.04.2024*** | | |
| Registration period | Start | End |  |
| ***30.04.2024*** | ***06.06.2024*** |
| **Lecture date** | *05.07.2024* | | |
| **Lecture time** | *10:00* | | |
| **Lecture location** | Bucharest, UTCB | | |
| Contest tests period | Start | End |  |
| ***01.07.2024*** | ***05.07.2024*** |
| Results communication period | Start | End |  |
| ***05.07.2024*** | ***05.07.2024*** |
| Contestation period | Start | End |  |
| ***08.07.2024*** | ***10.07.2024*** |
| **Contests subjects** | **Operating Systems:** History; Functions. Main components: kernel, command interpreter, utility modules. Classification of operating systems. Boot process. Installing an operating system. Partitioning. Types of user interfaces.  File system; Structure of a file. Operations in the file system. Basic commands in Windows and Linux for working with files. Paths in the file system. Virtual terminals. Directory operations.  Interrupt management: Interrupts: hardware, software (programmed, exceptions). Mechanism of interrupt operation. Interrupt control.  Processes: Process table. Foreground/background processes. Process states: active, waiting, blocked, terminated. Process scheduler. Threads.  Inter-process communication: Basic concepts: process competition, mutual exclusion, critical section. Synchronization mechanisms: semaphores, mutexes. File descriptors. Process management in Windows and GNU/Linux. Simple redirections. Basic notions: pipe operator, socket.  File operation commands. Displaying file contents; Commands for reorganizing file contents. Commands for extracting contents. Commands for merging file contents. Regular expressions.  Permission system: User management in GNU/Linux. Group management: groupadd, groupdel, groupmod, gpasswd. Changing the user in the terminal. Configuring resource access rights. Special permissions: setuid, setgid, sticky bit. Changing permissions.  Software packages management.  Basic notions about computer networks: OSI stack; IP addresses: station, network, broadcast. MAC addresses. Configuration files.  Task scheduling: User crontabs. Running scripts; Predefined variables. Command sequencing. Decision instructions. Cyclic commands.  **Signals and Systems:** Basic concepts; fundamental approaches. Applications in the field of buildings and housing. Technological scheme of a domotic automatic control system.  Continuous and discrete elementary signals. Definition. Classifications. Signal sampling. Recap of Fourier series, Fourier transform, and Laplace transform. Shannon's theorem. Integral transforms: Fourier, Laplace, discrete Fourier, Z transform. First-order filter. Steady-state and transient performance. Second-order filter. Steady-state and transient performance. System identification. System properties and linearity; causality, time-invariance; convolution systems. Processing of discrete-time signals and continuous-time signals in the time domain. Signals and systems with sampling. Determining output with transfer function and convolution function.  Numerical filters for 1D signals, FIR and IIR types. Performance. Designing a windowed FIR numerical filter. Commonly used filters.  Random signals. Probability density function. Histogram. Gaussian (normal) random signals. Mean, dispersion, standard deviation. Autocorrelation function. Power spectral density. System response to random signals.  2D signals (images). Histogram. Image processing by histogram equalization, low-pass filtering with moving average for images with Gaussian noise.  Robust automatic control system design in the frequency domain using the loop shaping method. Sensitivity function and complementary sensitivity function. Phase margin. Gain margin and modulus margin. Fundamental concepts of feedback loops. Stabilization and control.  **Computer architecture.** Structured Computer Organization:Evolution of computer generations. Basic concepts of a computing system: numeric computer, program, machine language.  Organization of computing systems. Definitions: computing system, information, code, data, information, algorithm, electronic computer, programming language.  Basic components of a computer: input unit, output unit, processing unit, control unit, memory units, arithmetic and logic unit.  Languages, levels, and virtual machines. Elementary notions: translation, interpretation, virtual machine. Hierarchy of levels in a modern computer.  Memory hierarchies. Hardware structure of a computer. Peripheral input/output devices, interface devices. Buses: system or internal, specialized, parallel, serial, unidirectional, bidirectional. Characteristics of storage devices: capacity, access speed, transfer rate.  Digital logic level. Logic gates. Boolean algebra elements. Elementary logic functions. Arithmetic bases of computing systems. Theoretical notions: numeral base, numeral system, conversion.  Microarchitecture level. Microinstructions. Instruction set architecture level. Data types. Instruction formats. Addressing modes.  Operating system level. Fundamental notions: operating system, operating environments, utility programs, user interfaces, memory management, file management, process management, peripheral device management.  Interconnected blocks of the microprocessor: control and control unit, arithmetic and logic unit, internal registers. Characteristics of a microprocessor: word length, maximum addressable memory, instruction set, operating speed.  Programming languages: machine code programming languages, assembly languages, high-level languages.  Assembly language level. Pseudoinstructions. Macro definitions. Link editing. Memory addresses and values. Defining and using macros. Conditional assembly directives.  **Programming languages.** General Programming Concepts: Modeling real-world problems, stages of developing an information system, types of programming languages, classifications, general overview of the Python language; Variables, expressions, and operations with variables; Conditions and comparisons; Iterative control structures; Functions; Working with strings; File operations; Data types and data structures: Python-specific data structures – lists, dictionaries, tuples; Using databases with Python; Data visualization in Python; Using APIs for data available on the Internet; Classes, inheritance, unit testing, and exceptions – basic concepts.  **Software engineering.** Project Stages. Software Project Life Cycle. Analysis Techniques. Classic Architectures. Representation Techniques with Diagrams. Development Methodologies. Agile Methodology: Basic Concepts, Teams, Events, Work Structures. Agile Methodology: Workflows, WIP Limits, Agile Metrics. Managing Agile Projects with Jira Software. Project Documentation Management: Main Categories of Documents, Documentation Management. Budget Management: Main Expense Categories, Factors Influencing Project Costs, Budget Examples. Risk Analysis and Mitigation/Management. Testing Techniques. Implementation. Project Completion. Handover Process. Maintenance | | |
| **Bibliography** | 1. S., Tanenbaum, „Sisteme de operare moderne”, Editura Byblos, 2004 2. D., Acostachioaie, S., Buraga, „Utilizare Linux – Notiuni de baza si practica”, Editura Polirom, 2004. 3. G., Dodescu, A., Vasilescu, B., Oancea, “Sisteme de operare LINUX si Windows”, Ed. Economica, 2003 4. A., Silberschatz, P., Galvin, “Operating Systems Concepts”, 4th edition, Addison-Wesley, 2001. 5. Cristian Oara, Dan Popescu, Analiza sistemelor liniare, cap7. Automatica, vol. 1, editor Ioan Dumitrache, Editura Academiei, 2009. 6. Alan V. Oppenheim, Alan S. Willsky, Semnale si Sisteme, Prentice-Hall, 1996. 7. Sorin Larionescu, Teoria sistemelor, Ed. Matrix ROM, Bucuresti, 2006, 360 pag. 8. John Doyle, Bruce Francis, Allen Tannenbaum, Feedback Control Theory, Macmillan Publishing Co., 1990 9. A., Cosmin, „Bazele informaticii I + II”, Ed. Cartea Universitara, 2006. 10. Ungureanasu, M. Petrea, L. Vornicu, „Invatati rapid limbajul de asamblare pentru procesoare x86 (Assembler)”, Ed. Edusoft, 2006, ISBN: 973-87714-1-2. 11. V., Lungu, „Procesoare Intel. Programare in limbaj de asamblare”, Editia a – II – a, Ed. Teora, 2005, ISBN: 973-20-0099-6, pag. 464. 12. S., Tanenbaum, „Organizarea structurată a calculatoarelor”, Ed. Byblos, 2004. 13. Mi, Lu, ”Arithmetic and Logic in Computer Systems” Wiley - Interscience, 2004, ISBN: 0471469459. 14. Iliescu S. S., Făgărășan I., Pupăza D., „Analiza de sistem în informatica industrială”, Agir, 2006 15. Bocu D., Bogu R. „Provocari si metode de abordare in managementul proiectelor IT”, Editura Albastră, 2013 16. Militaru Gh., „[Sisteme informatice pentru management](http://www.elefant.ro/carti/business-economie/management-leadership/sisteme-informatice-pentru-management-6765.html)”, Editura All, 2004 17. Atlassian, „The Agile Coach - Atlassian's no-nonsense guide to agile development”, ghid online, 2023 18. Atlassian, „Jira tutorials: Learn agile with Jira”, ghid online, 2023 19. Ono T., Bodek N., „Toyota Production System: Beyond Large-Scale Production”, Taylor & Francis, 2021 20. Documentație oficială limbaj Python v3 - https://docs.python.org/3/reference/ 21. Eric Matthews, „Python Crash Course - A Hands-on, Project-based Introduction to Programming”, Ediția a 2-a, 2019, Editura No Starch Press 22. Al Sweigart, „Automate the Boring Stuff with Python, 2nd Edition: Practical Programming for Total Beginners”, Ediția a 2-a, 2019, Editura No Starch Press 23. Allen Downey, Jeff Elkner and Chris Meyers, „Learning with Python - How to Think Like a Computer Scientist”, 2002, Editura Dreamtech | | |
| **Description of the contest procedure** | According to the contest Methodology of the Technical University of Civil Engineering Bucharest | | |
| **Document list** | According to the contest Methodology of the Technical University of Civil Engineering Bucharest | | |
| **Address for submitting the contest dossier** | Technical University of Civil Engineering Bucharest, Lacul Tei Avenue, 122-124, District 2, RO 020396, University Secretariat department | | |