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|  | **Course Syllabus** |

**1.** **Course Title:**

Operating systems

**2. Academic Level:**

Bachelor

**3. ECTS Credits:**

5 ECTS

**4. Semester:**

3, autumn semester

**5. School/Department:**

Institute of Computer Technologies and Information Security

**6. Location:**

English

Taganrog Campus, 2 Chekhov St., Taganrog

**7. Instructor:**

**8. Language of Instruction:**

Head of The Computer Engineering Department, Prof. Alexey Samoylov, email: [asamoylov@sfedu.ru](mailto:asamoylov@sfedu.ru)

**9. Course Description:**

The discipline is intended for students to acquire theoretical knowledge of the principles of organization, the basics of construction, the features of the functioning and use of modern operating systems, their mechanisms, hardware and software and technologies for supporting the processes of solving professional problems on a computer or in an applied information system environment; practical skills and abilities to install, configure, configure, protect, maintain and use the OS in various modes of operation.

**10. Course Aims:**

**11. Specific entry requirements (if any):**

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- to acquaint students with the purpose, functions, types, classification, principles of construction and modes of functioning of the OS;

-give an overview of modern operating systems, familiarize students with the specifics, differences in the properties and capabilities of popular operating systems; OS development trends at the present stage;

-to teach students to understand the conceptual foundations of OS-resource, process, functional components of OS; interruption and virtualization concepts; resource allocation disciplines; means of user interaction with the system; requirements for modern operating systems and trends in their development;

-to teach students to understand the architectures of modern operating systems, compatibility features, hardware dependency and portability of the OS, directions and means of virtualization, the capabilities of virtual machines and hypervisors.

**12. Course Content:**

1. Basic information about the OS. Purpose and definitions of the OS. The units of computational work and modes provided by the OS. The main (basic) functions of the OS. OS classification. Review of modern operating systems. OS construction principles. Requirements for the OS. General trends in the development of modern operating systems.

2. Conceptual foundations of OS. Resources and processes, their types and characteristics. Relationships between interrelated processes. Streams. Functional components of the OS. OS subsystems. API. Graphical user interfaces (GUIs). Interruption concept. Virtualization concept. Resource allocation disciplines used in the OS. Means of user interaction with the OS. OS security basics. Security objectives. Threats. Access control models. Hidden channels.

3. OS architecture. Classic architecture (Monolithic kernel and OS privileges, multilayer OS structure). Hardware dependency and OS portability. Microkernel architecture. New kernel and OS architecture options. Compatibility and multiple.

4. Management of processes and threads. Scheduling and scheduling of processes and threads. Dispatching and accounting for interrupt priorities in the OS. Dispatching system calls. Synchronization of processes and threads. Races, semaphores, synchronizing OS objects, signals.

5. Memory management. Types of addresses, UAP structuring. Memory allocation algorithms. Swap and virtual memory. Page RP. Segmental RP. Segment-page RP. Shared memory segments.

**13. Intended Learning Outcomes:**

Lectures, laboratory works

- Understanding of the OS-process and thread management tools (features and algorithms for scheduling and scheduling), interrupt dispatching, synchronization tools, as well as memory management tools, input-output devices and files, file systems and security tools;

- Practical skills of qualified work in various operating systems, the effective organization of computation and input-output processes when solving professional problems; optimal use of the resources of the computing complex, file systems and security tools in the OS.

**14. Learning and Teaching Methods:**

**15. Methods of Assessment/Final assessment information:**

Assessment methods: performing laboratory works, preparing essays, writing tests

**16. Reading List:**

1. Nuzhnov E.V. Operating systems [Electronic resource]. Tutorial. Part 1. Basics of

operating systems. - Taganrog: SFedU Publishing House, 2013 .- 144 p. - Access mode: URL

http://ntb.tti.sfedu.ru/UML/UML\_5418\_1.pdf.

2. Nuzhnov E.V. Operating systems [Electronic resource]. Tutorial. Part 2. Architecture and

mechanisms of operating systems. - Rostov-on-Don: SFedU Publishing House, 2014 .- 163 p. -

Access mode: URL http://ntb.tti.sfedu.ru/UML/UML\_5418\_2.pdf.

12.2. Additional literature

3. Methodical instructions for the implementation of a complex of laboratory work on the

general institute discipline "Operating systems" [Electronic resource] / E.V. Nuzhnov, A.N.

Samoilov, A.N. Belikov. - Taganrog: SFedU Publishing House, 2016 .- 143 p. - Access mode: URL

http://ntb.tgn.sfedu.ru/UML/UML\_5636.pdf.

4. Nuzhnov E.V. Operating systems [Electronic resource]: Educational-methodical manual

for the organization and implementation of independent work of students. - Taganrog: TTI SFU

Publishing House, 2010. - 52 p. - Access mode: URL http://ntb.tti.sfedu.ru/UML/UML\_3127\_3.pdf.

5. Nazarov S. V. Modern operating systems [Electronic resource] / S.V. Nazarov; A.I.

Shirokov - Moscow: Internet University of Information Technologies, 2011. - 280 p. - Access mode:

URL http://biblioclub.ru/index.php?page=book&id=233197.

6. Safonov VO Fundamentals of modern operating systems [Electronic resource] / V.O.

Safonov - Moscow: Internet University of Information Technologies, 2011. - 584 p. - Access mode:

URL http://biblioclub.ru/index.php?page=book&id=233210.

7. Gritsenko Yu. B. Operating systems [Electronic resource] / Yu.B. Gritsenko - Tomsk:

Tomsk State University of Control Systems and Radioelectronics, 2009. - 235 p. - Access mode:

URL http://biblioclub.ru/index.php?page=book&id=208655.

8. Methodical instructions for the implementation of a complex of laboratory work on the

general institute discipline "Operating systems" [Electronic resource] / E.V. Nuzhnov, A.N.

Samoilov, S.N. Drozdov. - Taganrog: SFedU Publishing House, 2019 .-- 131 p. - Access mode:

URL http://ntb.tgn.sfedu.ru/UML/UML\_5636.pdf;

https://hub.lib.sfedu.ru/repository/material/800919211/.