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<tr><td rowspan="7">Identification</td><td>Subject</td><td>CMS 520 Operating Systems 4 KU / 8 ECTS</td></tr>
<tr><td>Department</td><td>Computer Science</td></tr>
<tr><td>Program</td><td>Master</td></tr>
<tr><td>Term</td><td>Fall, 2023</td></tr>
<tr><td>Instructor</td><td>Shahnaz N.Shhabazova</td></tr>
<tr><td>E-mail:</td><td>shahbazova@gmail.com</td></tr>
<tr><td>Classroom/hours</td><td>41 Mehseti str. (Neftchilar campus), Tuesday 13:40-15:10 & Thursday 13:40-15:10</td></tr>
<tr><td>Prerequisites</td><td colspan="2">Information technologies, Architecture of a Computer Systems, Data Structures</td></tr>
<tr><td>Language</td><td colspan="2">English</td></tr>
<tr><td>Compulsory/Elective</td><td colspan="2">Required</td></tr>
<tr><td>Required textbooks and course materials</td><td colspan="2">Core textbooks:
Operating System Concepts, 9th edition Peter B. Galvin, Greg Gagne, Abraham Silberschatz, John Wiley & Sons, Inc
References:
Modern Operating Systems -By Andrew S. Tanenbaum (PHI)
Operating Systems 5th Edition, William Stallings, Pearson Education India
Web References:
http://www.cs.pdx.edu/~walpole/class/cs533/papers/RPC.pdf
http://www.cs.pdx.edu/~walpole/class/cs533/papers/lrpc.pdf</td></tr>
<tr><td>Course outline</td><td colspan="2">This course examines the important problems in operating system design and implementation. The operating system provides an established, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. The operating system is responsible for sharing resources (e.g., disks, networks, and processors), providing common services needed by many different programs (e.g., file service, the ability to start or stop processes, and access to the printer), and protecting individual programs from interfering with one another. The course will start with a brief historical perspective of the evolution of operating systems over the last fifty years and then cover the major components of most operating systems. This discussion will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems; and on operating system support for distributed systems.</td></tr>
<tr><td>Course objectives</td><td colspan="2">As a result of mastering the discipline, the student must know:
know the basic concepts, functions, composition and principles of operating systems;
architectures of modern operating systems;</td></tr>
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features of the construction and functioning of the families of operating systems "Unix" and "Windows";
principles of resource management in the operating system;
the main tasks of administration and how to perform them in the studied operating systems;

be able to:

manage operating system boot parameters;
perform configuration of hardware devices;
manage accounts, configure user's work environment settings;
manage disks and file systems, configure network settings,
manage the division of resources in the local network.

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<tr><td>Learning outcomes</td><td>Upon completion of this course, the students must be able to:
• Define different OS design techniques.
• Explain process management, processor scheduling, concurrent programming, deadlocks and synchronization, memory management, file management and I/O systems, disk scheduling.
• Distinguish main memory and virtual memory.
• Recognize user level and kernel level programming differences.
• Implement synchronization in multi-threaded programs.</td></tr>
<tr><td rowspan="4">Teaching methods</td><td>Lecture</td><td>x</td></tr>
<tr><td>Group discussion</td><td>x</td></tr>
<tr><td>Experiential exercise</td><td>x</td></tr>
<tr><td>Lab</td><td>x</td></tr>
<tr><td rowspan="6">Evaluation</td><td colspan="3">
<table>
<tr><th>Methods</th><th>Date/deadlines</th><th>Percentage (%)</th></tr>
<tr><td>Midterm Exam</td><td></td><td>30</td></tr>
<tr><td>Activity</td><td></td><td>10</td></tr>
<tr><td>Project</td><td>16/12/2023</td><td>20</td></tr>
<tr><td>Final Exam</td><td></td><td>40</td></tr>
<tr><td>Total</td><td></td><td>100</td></tr>
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<tr><td>Policy</td><td>

Preparation for class
The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text. Reading the assigned chapters and having some familiarity with them before class will greatly assist your understanding of the lecture. After the lecture, you should study your notes and work relevant problems and cases from the end of the chapter and sample exam questions.

Throughout the semester we will also have many review sessions. These review sessions will take place during the regularly scheduled class periods.
Withdrawal (pass/fail)
This course strictly follows grading policy of the School of Engineering and Applied Science. Thus, a student is normally expected to achieve a

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	mark of at least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year. • **Cheating/plagiarism** Cheating or other plagiarism during the Quizzes, Mid-term and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0), without any considerations. • **Professional behavior guidelines** The students shall behave in the way to create favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited. • **Ethics** Students should not arrive in late to class. All cell phones must be turned off and stowed away before entering class. Use of any electronic devices is not allowed in the classroom and violators will be punished accordingly. • **Exams** All exams will be closed book. • **Project** This course is not devoted to the creation of software applications, but to the study of input-output control systems. The result of the project is the most important part, and the evaluation is given to projects that are executed on the computer. The number of people in each project group can be a maximum of 3 people. Participants have their own specific levels of task completion in the project. The presentation, which makes up a maximum of one-third of the entire project evaluation, should be presented in less than ten minutes, and answers to questions are also included. All team members are responsible for answering any questions about the project.

WK	Date/Day (tentative)	Topics	Textbook/Assignments
1.	22/09/2023 Lecture	**Introduction. Architecture, Goals & Structures of O.S, Basic functions**	Chapter 01
	22/09/2023 Laboratory	**Exercises**	Chapter 01
2.	28/09/2023 Lecture	**Process Management. Process Concept, Process states, Process control, Threads.**	Chapter 02-03
	28/09/2023 laboratory	**Exercises**	Chapter 02-03
3	05/10/2023 Lecture	**Uni-processor Scheduling: Types of scheduling: Preemptive, Non preemptive, Sched3.uling algorithms: FCFS, SJF, RR**	Chapter 04-05
	05/10/2023 laboratory	**Exercises**	Chapter 04-05
4	12/10/2023 Lecture	**Concurrency control, Concurrency**	Chapter 06-07
	12/10/2023 laboratory	**Exercises**	Chapter 06-07
5	19/10/2023 Lecture	**Synchronization, Deadlock**	Chapter 08-09
	19/10/2023 laboratory	**Exercises**	Chapter 08-09
6	26/10/2023 Lecture	**Memory Management. Virtual Memory.**	Chapter 10-11
	26/10/2023 laboratory	**Exercises**	Chapter 10-11
7	02/11/2023 Lecture	**I/O management & Disk scheduling.**	Chapter 12-13
	02/11/2023 laboratory	**Exercises**	Chapter 12-13
8	09/11/2023 Lecture	**Preparation for the midterm**	Chapter 14-15
	09/11/2023 laboratory	**Midterm Exam** **Exercises**	Chapter 14-15
9	16/11/2023 Lecture	**Design issues, I/O Buffering, Disk Scheduling** **RAID, Disk Cache.**	Chapter 16-17
	16/11/2023 laboratory	**Exercises**	Chapter 16-17
10	23/11/2023	**Inter Process Communication** **Basic Concepts of Concurrency,**	Chapter 18-19

	Lecture	**Cooperating process**	
	23/11/2023 laboratory	**Exercises**	Chapter 18-19
11	30/11/2023 Lecture	**Shared-Memory Solution, Basic Concepts of Inter-process Communication and Synchronization**	Chapter 20-21
	30/11/2023 laboratory	**Exercises**	Chapter 20-21
12	07/12/2023 Lecture	**Multi-Processor Based and Virtualization Concepts**	Chapter 22-23
	07/12/2023 laboratory	**Exercises**	Chapter 22-23
13	14/12/2023 Lecture	**Virtual machines; supporting multiple operating systems simultaneously on a single hardware platform; running one operating system on top of another.**	Chapter 24-25
	14/12/2023 laboratory	**Exercises**	Chapter 24-25
14	21/12/2023 Lecture	**Projects/Presentations**	
	21/12/2023 laboratory	**Exercises**	Chapter 25-28
15	28/12/2023 Lecture	**Preparation for the final exam Exercises**	
	28/12/2023 laboratory	**Exercises**	Chapter 29-30