ASTANA IT UNIVERSITY

«Approved»
by the Dean
Zhakebayev D.B.
«25» of November 2022

Syllabus
Academic Year 2022-2023

1. General Information	
Course title	Operating System Concepts
Degree cycle (level)/ major	6B06101 Computer Science 6B06301 "Cyber Security" 6B06201 "Telecommunications" 6B06202 "Smart Technologies"
Year, term	2, 5
Number of credits	5
Language of delivery:	English
Prerequisites	
Postrequisites	
Lecturer(s)	Tleubayeva Arailym, MSc in Technical Science (Information Systems), senior-lecturer, CE Dept., a.tleubayeva@astanait.edu.kz, Murat Raikhan Kairatkyzy, master of technical science, teacher of the CE Department., m.raikhan@astanait.edu.kz
2. Goals, Objectives and Learning Outcomes of the Course	
1. Course Description	The course provides students with knowledge of the basic mechanisms and structure of operating systems, the specifics of their interaction with the hardware of the computer, and the principles of system programming at the level of operating systems of the Linux family.
2. Course Goal(s)	The aim of the course is for students to acquire fundamental theoretical knowledge of the principles of modern operating systems, methods of organising computational processes, methods of developing algorithms for the interaction of applications with the operating system and mechanisms for their implementation
3. Course Objectives:	This course will cover topics including: – Fundamentals of system hardware – Introduction to OS concepts – OS processes and threads – Thread concurrency and deadlocks – Memory management – The Linux Foundation – Introduction to Linux Commands – Introduction to Shell Scripting – The Linux file system. C program compilation with gcc
4. Skills & Competences	Your Practice Skill after Course: – Introduction to Linux/UNIX Philosophy – Positional Number Systems & Binary Operations Understanding – Getting Access to a Remote Linux/UNIX/Mac/Windows

	Systems – Installing VirtualBox on Windows and Mac – Installing Linux/Windows Using an Image for VirtualBox – Learn Linux/UNIX Directory Structure – Basic Shell and Linux/UNIX Commands – Linux Package Management – Working with Directories, Listing Files and Understanding 'ls -l' Output – OS File and Directory Permissions Understanding – Finding Files and Directories, Wildcards, Files Globbing – View/Edit Files Using vi, nano Editors – Understanding Basic & Extended Regular Expressions – Working with Linux/UNIX Filters utilities – User and Group Management Conception – File and Directory Extended Attributes Understanding (xattr) – Managing Linux/UNIX Processes and Jobs – At and Cron Scheduling – 19. Shell Scripting to Automate Tasks
5. Course Learning Outcomes**:**	– By the end of this course students will be able to: – Define a computer – Define what an operating system is – Describe components of an operating system – Describe how threads work in an operating system – Describe how memory works in an operating system – Describe how data is represented and how computers execute instructions to use and modify data in order to solve problems. – A good working knowledge of Linux – How to navigate through major Linux distributions – System configurations and graphical interface of Linux – Basic command line operations – Common applications of Linux
6. Methods of Assessment	- Quiz; - Practical tasks; – Assignments. Emphasis on building stuff that works: Practical skills. • Lateness policy is designed to encourage success rather than timeliness, but we have to find a balance. • Grading is mostly on functionality, though there is a role for clarity, modularity, efficiency and style. • Readings are important to make our class time more effective and to gain confidence about learning from tutorials, references and so forth. • Classwork gives you a chance to make mistakes with support • LW & PW Assignments integrate several skills and go beyond Classwork
7. Reading List	Assigned reading and presentation material should be read before class begins. Readings are listed in the schedule section. All necessary updates and / or changes to the course will be reflected in the Learning Management System (moodle.astanait.edu.kz). Basic Literature:

	1. Operating System Concepts, 9th Edition. 2012 - A. Silberschatz, P. Galvin, G. Gagne. 2. Computer Organization and Architecture, 10th Edition. 2016 - W. Stollings. 3. Modern Operating Systems, 4th.ed. 2015 - A. Tanenbaum, H. Bos. 4. Operating System Concepts and Basic Linux Commands. 2017.- Shital Vivek Ghate. 5. Linux for Developers: Jumpstart Your Linux Programming Skills.2017.- William "Bo" Rothwell. Supplementary literature: 6. Windows Internals. Part I, 7th.ed. 2017 - M. Russinovich, D. Solomon, A. Ionescu. 7. Windows Internals. Part II, 6th.ed. 2012 - M. Russinovich, D. Solomon, A. Ionescu. 8. Enterprise Open Source and Linux | Ubuntu 9. Oracle® VM VirtualBox® 10. Best Online Linux Terminals and Online Bash Editors (itsfoss.com)
1. Resources	Online journals, article, papers, books and internet resources as well as online emulators and online software for simulation.
2. **Course policy**	**Course and University policies include:** **Attendance:** Attendance is not allocated any grading points in the marking scheme, but is compulsory to pass the course. Normally students are required to achieve course attendance of minimum 70% to get admitted to the examination rubric. In case a student misses 30% or more class sessions without a valid excuse the instructor has the right to mark him as "not graded". In such case a student is not admitted to the exam and automatically fails the course. In cases, when a student misses class session due to valid reasons (is excused by the instructor or the dean's office) he or she has to confirm the absence reason using a valid document in accordance with the academic policy of AITU. It should be NOTED that in cases when a student is excused for 30% of the scheduled class sessions or more he or she has to study material provided under the course on their own. Course instructor might provide additional opportunities to submit missed graded pieces of work during office hours or conduct alternative assessment exercises using method of his or her choosing. **Preparation for Class**: Class participation is a very important part of the learning process in this course. Although not explicitly grade, students will be evaluated on the QUALITY of their contributions and insights. Quality comments possess one or more of the following properties: - Offers a different and unique, but relevant, perspective;

	- Contributes to moving the discussion and analysis forward; - Builds on other comments. **Class work**: The duration of each lecture and practical lesson is 50 minutes for offline class, and 40 minutes for online class. Students are expected to complete all readings and assignments ahead of time, attend class regularly and participate in class discussions. In case of systemic student's misconduct, the student can be dispensed from the classes. **Being late on class:** When students come to class late, it can disrupt the flow of a lecture or discussion, distract other students, impede learning, and generally erode class morale. Moreover, if left unchecked, lateness can become chronic and spread throughout the class. Therefore, the being late to the class is not welcome and can have restriction activities by the course instructor. **Attestation I and II:** Students, who score less than 25% for Attestation period I or Attestation period II (RK1/RK2) automatically fail the course. **Home work / Assignments**: The assignments are designed to acquaint students with the theoretical knowledge and practical skills required for the course. The textbook readings will be supplemented with materials collected from recent professional articles and journals. In case of using someone's work (papers, articles, any publications), all works must be properly cited. Failure to cite work will be resulted as a cheating from the students and may be a subject of additional disciplinary measures. **Cheating from other students will be strictly punished with a mark of 0 for every student with the same work.** **Final project: Linux Kernel Development** An individual (team) project (report) and presentation (slides). At the completion of this course each student /each team has to submit an online project version conforming to the project outline, as well as to prepare and present a slide presentation that follows the presentation outline. Project iterations would be required to submit as well. Students should submit to the LMS Moodle the Written Report of Final project and Slide-Presentation 2-3 days before the Final exam day.) **Laptops and mobile devices** can only be used for classroom purposes when directed by the course instructor. Misuse of laptops or handheld devices will be considered a breach of discipline and appropriate action will be initiated by the instructor. **Online lessons** can be used in case if there won't be a chance to make offline traditional lessons. It must not discourage the interest and enthusiasm of students. The main software to run the online lessons is Microsoft Teams for video calls and live webinars, and Moodle (moodle.astanait.edu.kz) as a Learning Management System. Also, some alternatives such as Telegram, Zoom, or other messenger may be

	involved as an additional workaround. **Cheating and plagiarism** are defined in the Academic conduct policies of the university and include: 1. Submitting work that is not your own papers, assignments, or exams; 2. Copying ideas, words, or graphics from a published or unpublished source without appropriate citation; 3. Submitting or using falsified data; 4. Submitting the same work for credit in two courses without prior consent of both instructors. Any student who is found cheating or plagiarizing on any work for this course will receive 0 (zero) for that work and further actions will also be taken regarding academic conduct policies of the university. **Academic Conduct Policies of the university:** The full texts of all the academic conduct code will be posted to the students using Learning Management System (moodle.astanait.edu.kz). **Contacting the Course instructor**: The easiest and most reliable way to get in touch with the course instructor is by email. Students must feel free to send email if you have a question related to the course. Instructor responds as soon as they can but not always instantaneously. Besides that, students are also welcomed to arrange a one-to-one meeting with the instructor by their office during office hours to discuss the class using both offline and online.

** Final exam can be given by instructor in the any other forms such as Written Exam, Final Quiz, Oral Tasks and Exams, etc.*

3. Course Content

#	Abbreviation	Meaning
1	ISIS	Instructor-supervised independent work
2	SIS	Students' independent work
3	IP	Individual project
4	PA	Practical assignment
5	LW	Laboratory work
6	MCQ	Multiple choice quiz

3.1 Lecture, Practical/Seminar/Laboratory Session Plans

Week No	Course Topic	Lectures (H/W)	Practice sessions (H/W)	Lab. sessions (H/W)	TSIS (H/W)	SIS (H/W)
1	Fundamentals of System Hardware. Kypc | Computer Hardware and Operating Systems | edX	Online 2 hours	Online 3 hours	0	1	9

2	Processes and Threads. Thread Concurrency and Deadlocks. Memory Management Kypc | Computer Hardware and Operating Systems | edX	Online 2 hours	Online 3 hours	0	1	9
3	The Linux Foundation.Linux Philosophy and Concepts Linux Basics and System Startup. Kypc | Introduction to Linux | edX	Online 2 hours	Online 3 hours	0	1	9
4	Graphical Interface.System Configuration from the Graphical Interface LInux Kypc | Introduction to Linux | edX	Online 2 hours	Online 3 hours	0	1	9
5	Common Applications. Command Line Operations Linux Kypc | Introduction to Linux | edX	Online 2 hours	Online 3 hours	0	1	9
6	Finding Linux Documentation Kypc | Introduction to Linux | edX	Online 2 hours	Online 3 hours	0	1	9
7	Processes. File Operations Kypc | Introduction to Linux | edX	Online 2 hours	Online 3 hours	0	1	9
8	Introduction to Linux Commands Kypc | Linux Commands & Shell Scripting Basics | edX	Online 2 hours	Online 3 hours	0	1	9
9	Introduction to Shell Scripting Kypc | Linux Commands & Shell Scripting Basics | edX	Online 2 hours	Online 3 hours	0	1	9
10	The Linux file system. C program compilation with gcc Kypc | Linux Basics: The Command Line Interface | edX	Online 2 hours	Online 3 hours	0	1	9
	Total hours: 150	**20**	**30**	**0**	**10**	**90**

List of Assignments for Student Independent Study

№	**Assignments (topics) for Independent study**	**Hours**	**Recommended literature and other sources (links)**	**Form of submission**
1	**2**	**3**	**4**	**5**
1	Computing basics (number systems, binary arithmetic, boolean algebra)	9	https://github.com/Arailym-ray/AITU-Operating-system-concepts.git	moodle.astanait.edu.kz
2	Installing Virtual Machines for Oracle VirtualBox	9	Oracle® VM VirtualBox® Enterprise Open Source and Linux | Ubuntu https://github.com/Arailym-ray/AITU-	moodle.astanait.edu.kz

			Operating-system-concepts.git	
3	Using SSH/RDP for remote Linux / UNIX / Mac / Windows servers management	9	https://github.com/Arailym-ray/AITU-Operating-system-concepts.git	moodle.astanait.edu.kz
4	Getting Started with Linux Terminal	9	https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBM-LX0117EN-SkillsNetwork/labs/module 1/introducing-linux-terminal.md.html	moodle.astanait.edu.kz
5	Linux/Unix command line basics	9	https://github.com/Arailym-ray/AITU-Operating-system-concepts.git	moodle.astanait.edu.kz
6	Linux/Unix shall environment variables	9	https://github.com/Arailym-ray/AITU-Operating-system-concepts.git	moodle.astanait.edu.kz
7	Linux shell. Files globbing & streams redirection.	9	https://github.com/Arailym-ray/AITU-Operating-system-concepts.git	moodle.astanait.edu.kz
8	Linux Permissions. SUID/SGID/Sticky Bits.	9	https://github.com/Arailym-ray/AITU-Operating-system-concepts.git	moodle.astanait.edu.kz
9	Unix regular expressions and filters.	9	https://github.com/Arailym-ray/AITU-Operating-system-concepts.git	moodle.astanait.edu.kz
10	Linux/UNIX Shell Programming.	9	https://github.com/Arailym-ray/AITU-Operating-system-concepts.git	moodle.astanait.edu.kz

4. Student Performance Evaluation System for the Course

Period	Assignments	Number of points	Total

1st attestation	**Assignments**:** assignment 1, assignment 2, assignment 3, **Mid Term** - Quiz	**60** 20 20 20 **40**	100
2nd attestation	**Assignments**:** assignment 4, assignment 5, assignment 6, **End Term** - Quiz	**60** 20 20 20 **40**	100
Final exam*	TP (individual or team Project)		100
Total	**0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final**		**100**

Achievement level as per course curriculum shall be assessed according to the evaluation chart adopted by the academic credit system.

Letter Grade	Numerical equivalent	Percentage	Grade according to the traditional system
A	4,0	95-100	Excellent
A-	3,67	90-94	
B+	3,33	85-89	Good
B	3,0	80-84	
B-	2,67	75-79	
C+	2,33	70-74	
C	2,0	65-69	Satisfactory
C-	1,67	60-64	
D+	1,33	55-59	
D	1,0	50-54	
FX	0	25-49	Fail
F	0	0-24	

Based on the specific grade for each assignment, and the final grade, following criteria must be satisfied:

Grade	Criteria to be satisfied
90-100	- Work would be worthy of further dissemination under appropriate conditions - Mastery of advanced methods and techniques at a level beyond that explicitly taught - Ability to synthesize and employ in an original way idea from across the subject - Outstanding command of critical analysis and judgment
80-89	- Excellent range and depth of attainment of intended outcomes - Mastery of a wide range of methods and techniques - Evidence of study and originality of what has been taught - Able to display a command of critical analysis and judgement

70-79	- Attained all the intended learning outcomes for a unit - Able to use well a range of methods and techniques to come to conclusions - Able to employ critical analysis and judgement
60-69	- Some limitations in attainment of learning objectives, but has managed to grasp most of them - Able to use most of the methods and techniques taught - Evidence of study and comprehension of what has been taught but grasp insecure - Some grasp of the issues and concepts underlying the techniques and material taught, but weak and incomplete
50-59	- Attainment of only a minority of the learning outcomes - Able to demonstrate a clear but limited use of some of the basic methods and techniques taught - Weak and incomplete grasp of what has been taught - Deficient understanding of the issues and concepts underlying the techniques and material taught
25-49	- Attainment of nearly all the intended learning outcomes deficient - Lack of ability to use at all or the right methods and techniques taught - Inadequately and incoherently presented - Wholly deficient grasp of what has been taught - Lack of understanding of the issues and concepts underlying the techniques and material taught
0-24	No significant assessable material, absent or assessment missing a must pass component

5. Methodological Guidelines

Assessment is administered continuously throughout the course. The students are rated against their performance in continuous rating administered throughout the semester (60%) and summative rating done during the examination session (40%), total 100%. Continuous rating is students' on-going performance in class and independent work. Class work is assessed for attendance, laboratory works' defense and in- class assessments.

- **ISIS (Instructor Supervised Student Independent Study)** -comprises presentation to be done by students independently and checked by instructor.
- **Mid-term and End-term** is a review of the topics covered and assessment of each student's knowledge. The form of the midterm and end term exams is complex.
- **Final assessment** is a combination of both individual (team) project (report) and oral presentation (slides) to evaluate the students' academic performance and professional skills. At the completion of this course each student has to submit an online project version conforming to the project outline, as well as to prepare and present a slide presentation that follows the presentation outline. Project iterations would be required to submit as well. Students should submit the written Report of Final project and slide-Presentation 3 days before the Final exam day.

6. Lecturer (lecturers) approvals Full name Job title Date Sign

Full name	Job title	Date	Sign
Tleubayeva Arailym Orynbaykyzy			

Murat Raikhan Kairatkyzy			

Director of Department of Computer Engineering **A.Smaiyl**