Student Syllabus

for the course

«SDB3212 Operating systems»

Course code and title

1. General information	
Faculty	Information Technology
Major code and title	5B060200 – Computer Science
Year, semester	1 year, 2 semester
Subject category	basic
Number of Credits	4
Language of Delivery:	English
Prerequisites:	AKS3211 Architecture of computer systems
Postrequisites	
Lecturer	Rakhatov Dastan Tuleubekovich, lecturer, tutor, master Room 114, e-mail: d.rakhatov@iitu.kz
Instructors	Rakhatov Dastan Tuleubekovich, lecturer, tutor, master Room 114, e-mail: d.rakhatov@iitu.kz

2. Goals, objectives and learning outcomes of the course

Course goals:

- To give introduction of Operating system development
- To give basic knowledge of structure of operating systems
- To give basic knowledge to work with Operating systems Linux and Windows 8.1
- To give basic knowledge to manage and administrate operating systems Linux
- To give deep knowledge on operating system Windows 8.1

Course objectives

The objective of this course is to introduce the student to the principles underlying the design and implementation of contemporary computer operating systems. This course is designed for students majoring in Computer Science or in areas having a strong emphasis in Computer Science.

Course outcomes

Students successfully completing the course will be able to

- Design and implementation issues of contemporary operating systems.
- Detailed analysis of process, multithreading, symmetric multiprocessing, and microkernels.
- Memory management techniques, including virtual memory.
- Various approaches to process scheduling.
- Operating system control of Input/Output.
- File management.
- Distributed systems.
- Computer security.

3. Course description

The text for the course is "*Operating Systems Internals and Design Principles (7th Edition)*" by William Stallings. This book will be used extensively throughout the course including review questions, problems, and assignments.

Each student will individually implement a preemptive, prioritized operating system with virtual memory and file management capabilities.

LECTURES:

PowerPoint lectures and class discussions will be presented each class period as outlined on the course schedule. There will be times when information is given in class that is not in the text nor on the Intranet system. It is very important that students attend class and take careful notes.

PROGRAMMING ASSIGNMENTS:

Programming assignments consist of six labs that build upon each other and are designed to

emphasize topics and objectives discussed in class.

PROGRAMMING ENVIRONMENT:
The choice of the software tools and programming environment is left up to the student's discretion. **The C programming language will be used for the programming assignments.**

4. Course policy

Students are forbidden to:

- submit any tasks after the deadline. The mark for late submissions is decreased (each day for 50%)
- cheat. Plagiarized papers shall not be graded and receive a "0";
- be late for classes;
- retake any tests, unless there is a valid reason for missing them;
- use mobile phones in class;

Students should always

- be appropriately dressed (formal/semi- formal styles are acceptable);
- show consideration for and mutual support of teachers and other students;
- let the teacher know of any problems arising in connection with their studies.

Instructor may change course outline at any time during the course. Students may come to see Tutor only at Office Hours time or by appointment.

5. Literature

Basic literature:
William Stallings - Operating Systems：Internals and Design Principles(7th Edition); Prentice Hall, ISBN-13: 978-0-13-230998-1 (alk. paper),

Supplementary literature:
The main course text book is Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, *Operating System Concepts*, 9/e, John Wiley & Sons, Inc., 2013.

6. Course calendar

6.1 Lecture, practical/seminar/laboratory session plans

	Abbreviation	Meaning
	TSIS	Teacher-supervised independent work (СРСП)
	SIS	Students' independent work (СРС)
	IP	Individual project
	PA	Practical assignment
	LW MCQ	Laboratory Work Multiple choice quiz

Week No	Course Topic	Reference Materials	Lectures (_1 h/w)	Practice sessions (_1 h/w)	Lab. Sessions (2 h/w)	TSIS (_ h/w)	SIS (_ h/w)
1	**Computer System Overview** Basic Elements. Processor Registers. Instruction Execution. Interrupts. The Memory Hierarchy. Cache Memory. I/O Communication Techniques.	Chapter 1	1	1	2	2	3

2	**Operating System Overview** Operating System Objectives and Functions. The Evolution of Operating Systems. Major Achievements. Developments Leading to Modern Operating Systems. Microsoft Windows Overview. Traditional Unix Systems. Modern Unix Systems. Linux.	Chapter 2	1	1	2	2	3
3	**Process Description and Control** What is a Process? Process States. Process Description. Process Control. Execution of the Operating System. Security Issues. Unix SVR4 Process Management.	Chapter 3	1	1	2	2	3
4	**Uniprocessor Scheduling** Types of Processor Scheduling. Scheduling Algorithms. Traditional Unix Scheduling.	Chapter 9	1	1	2	2	3
5	**Threads, SMP, and Microkernels** Processes and Threads. Symmetric Multiprocessing. Microkernels. Windows Thread and SMP Management. Solaris Thread and SMP Management. Linux Process and Thread Management.	Chapter 4	1	1	2	2	3
6	**Concurrency: Mutual Exclusion and Synchronization** Principles of Concurrency. Mutual Exclusion: Hardware Support. Semaphores. Monitors. Message Passing. Readers/Writers Problem.	Chapter 5	1	1	2	2	3
7	Mid term						
8	**Concurrency: Deadlock and Starvation** Principles of Deadlock. Deadlock Prevention. Deadlock Avoidance. Deadlock Detection. An Integrated Deadlock Strategy. Dining Philosophers Problem.	Chapter 6	1	1	2	2	3

9	**Multiprocessor and Real-Time Scheduling** Multiprocessor Scheduling. Real-Time Scheduling. Linux Scheduling. Unix SVR4 Scheduling. Windows Scheduling.	Chapter 10	1	1	2	2	3
10	**Distributed Process Management** Process Migration. Distributed Global States. Distributed Mutual Exclusion. Distributed Deadlock.	Chapter 18	1	1	2	2	3
11	**Memory Management** Memory Management Requirements. Memory Partitioning. Paging. Segmentation. Security Issues.	Chapter 7	1	1	2	2	3
12	**Virtual Memory** Hardware and Control Structures. Operating System Software. Unix and Solaris Memory Management. Linux Memory Management. Windows Memory Management.	Chapter 8	1	1	2	2	3
13	**I/O Management and Disk Scheduling** I/O Devices. Organization of the I/O Function. Operating System Design Issues. I/O Buffering. Disk Scheduling. Raid. Disk Cache. Unix SVR4 I/O. Linux I/O. Windows I/O.	Chapter 11	1	1	2	2	3
14	**File Management** Overview. File Organization and Access. File Directories. File Sharing. Unix File Management. Linux Virtual File System. Windows File System.	Chapter 12	1	1	2	2	3
15	End term						
	Total hours		**15**	**15**	**30**	**30**	**45**

6.2 Knowledge Assessment:

3 SIS	RK I	63%
6 LW	RK I	18%
6 P	RK I	6%
Mid term	RK I	7%
Attendance	RK I	6%
3 SIS	RK II	60%
7 LW	RK II	21%
7 P	RK II	7%
End term	RK II	5%
Attendance	RK II	7%

TSIS – Review question on each chapter [William Stallings - Operating Systems：Internals and Design Principles(7th Edition)-2011.2.28]

6.3 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	**SIS I. Installation Linux –Ubuntu to flash card. Command line. Basic Linux commands [5th week]** **Objective**: To study the bases and get the skills to work with the command line and the basic commands of Linux. **Task**: To study commands who, whoami, whereis, dmesg, ps, top, kill. Learn how to customize the environment variables and work with the help system.	15	**Student independent work.doc**	Defense, and Report
2	**SIS II. Working with the file system [6th week]** **Objective**: Learn the basics and get the skills to work with the file system. **Task**: To study the commands for navigating through the file system and change it.	15	**Student independent work.doc**	Defense, and Report
3	**SIS III. Working with storage devices [7th week]** **Objective**: To study the bases and get the skills to work with storage devices (mount, layout, create a file system). **Task**: To study the mount command, fdisk, mkfs.	15	**Student independent work.doc**	Defense, and Report
4	**SIS IV. Groups and Users [13th week]** **Objective**: To study the bases and get the skills to work with groups and users (create, edit, delete, set permissions). **Task**: To study commands useradd, usermod, userdel, groups, groupadd, groupmod, groupdel, chmod файлы /etc/passwd, /etc/shadow, /etc/group.	15	**Student independent work.doc**	Defense, and Report
5	**SIS V. Working with text data [14th week]** **Objective**: To study the bases and get the skills conveyors, filters, basic commands for processing text data. **Task**: Learn to use belts, filters, commands grep and find.	15	**Student independent work.doc**	Defense, and Report
6	**SIS VI. Networking [15th week]** **Objective**: To study the basics of network configuration on Linux. **Task**: Manually configure a connection to the Internet through a gateway.	15	**Student independent work.doc**	Defense, and Report

7. Student performance evaluation system for the course

Period	Assignments	Number of points	Total
1st attestation	laboratory works:	**18**	100
	1 LW	3	
	2 LW	3	
	3 LW	3	
	4 LW	3	
	5 LW	3	
	6 LW	3	
	Practice:	**6**	
	1 Exercise	1	
	2 Exercise	1	
	3 Exercise	1	
	4 Exercise	1	
	5 Exercise	1	
	6 Exercise	1	
	Student Independent Study I [deadline: 5]	**21**	
	Student Independent Study II [deadline: 6]	**21**	
	Student Independent Study III [deadline: 7]	**21**	
	Attendance	**6**	
	Mid term	**7**	
2nd attestation	laboratory works:	**21**	100
	1 LW	3	
	2 LW	3	
	3 LW	3	
	4 LW	3	
	5 LW	3	
	6 LW	3	
	7 LW	3	
	Practice:	**7**	
	1 Exercise,	1	
	2 Exercise,	1	
	3 Exercise,	1	
	4 Exercise,	1	
	5 Exercise,	1	
	6 Exercise	1	
	7 Exercise	1	
	Student Independent Study IV [deadline: 13]	**20**	
	Student Independent Study V [deadline: 14]	**20**	
	Student Independent Study VI [deadline: 15]	**20**	
	Attendance	**7**	
	End term	**5**	
Final exam	**Exam**		100
Total	**0,3*1stAtt+0,3*2ndAtt+0,4*Final**		**100**

*If the number of absences exceeds 20%, student will be automatically scheduled for a Retake (summer semester)

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	Satisfactory
C	2,0	65-69	
C-	1,67	60-64	
D+	1,33	55-59	
D	1,0	50-54	
F	0	0-49	Fail
FX	0	25-49	

If student gets grade of 25-49% in the Final exam, then the student can retake Final Exam on a paid basis.

8. METHODOLOGICAL GUIDELINES

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

Teaching methodology

Theory classes:

- lectures developing the theoretical aspects of the subject
- practical classes aimed at applying theory to problems.

Workshop classes:

- practical classes in which students solve problems in groups or individually.

SIS (Student Independent Study) comprises topics related problems to be done by students independently and checked in class.

TSIS (Teacher Supervised Student Independent Study) comprises individual homework assignments to be done by students independently and checked by teacher.

Mid-term examination is held in the 8th week of the semester and includes topics 1-7 of the course.
End-of-term examination is held in the last week of the semester and includes topics 8-15 of the course.

Final examination is a computer-based test that consists of multiple choice questions covering all topics of the course.