COURSE SPECIFICATION FORM,
approved by the Academic Council 17.06.2015 (#39)

SECTION A: DEFINITIVE

1.	**General course information**		
1.1	School: Science and Technology	1.6	Credits (ECTS): 6
1.2	Course Title: Operating Systems	1.7	Course Code: CSCI 332
1.3	Pre-requisites: CSCI 231	1.8	Effective from: *Fall 2018*
1.4	Co-requisites: none		
1.5	Computer Science ☒ Core ☐ Elective Programs: *(in which the course is offered)*		

2. Course description (max.150 words)

The course introduces students to Operating Systems, their concepts and building blocks. The students will learn to understand, apply, and extend these concepts through a focus on systems programming in the UNIX environment. They will be introduced to the main components of modern computer operating systems: resource allocation, process scheduling, memory management, file systems, management of input and output devices, multi-processor systems and synchronization.

3.	**Summative assessment methods** (tick if applicable)**:**				
3.1	Examination	☒	3.5	Presentation	☐
3.2	Term paper	☐	3.6	Peer-assessment	☐
3.3	Project	☐	3.7	Essay	☐
3.4	Laboratory Practicum	☒	3.8	Other *(specify)*	_____

4. Course aims

The aims of the course are:

1) To introduce students to the basics concepts of the design of operating systems
2) To familiarize students with systems-level software development techniques

5. Course learning outcomes (CLOs)

5.1

After taking and successfully passing this course, the students will be able to

1) Use a UNIX operating system as a user and as a developer
2) Use one of the common shells (e.g. bash, csh) on the command line and in simple scripts
3) Read, understand and explain complex C code
4) Understand and use UNIX systems calls, in particular those for file I/O, process and thread management, inter-process communications
5) Design and develop systems-level C programs of some significant complexity, for example:
   - Servers which can handle multiple simultaneous clients

- Programs which are composed of multiple cooperating processes

6) Understand and use process and thread synchronization techniques
7) Understand basic operating systems concepts: synchronization, process scheduling, memory management, file systems and resource allocation

5.2

CLO ref #	Program Learning Outcome(s) to which CLO is linked	Graduate Attribute(s) to which CLO is linked
1 - 7	1. Identify and describe the significant issues, challenges, and milestones within the field; 2. Apply the key mathematical skills relevant to the discipline; 3. Assess technical problems and establish requirements for their solution; 4. Design and implement substantive computer systems, in the form of devices or software; 5. Identify the theoretical capabilities and practical limitations related to computing systems;	Possess an in-depth and sophisticated understanding of their domain of study. Be intellectually agile, curious, creative and open-minded.

SECTION B: NON-DEFINITIVE

Course Syllabus

Details of teaching, learning and assessment

6.	**Detailed course information**		
6.1	Academic Year: 2020-21	6.3	Schedule (class days, time): Lecture1 – M.W.F 11 ~11:50 am Lecture2-3 – M.W.F 13 ~13:50 pm
6.2	Semester: Spring 2021	6.4	Distance Learning

7. Course leader and teaching staff

Position	**Name**	**Office #**	**Contact information**	**Office hours**
Course Leader(s)	Mona Rizvi Jurn Gyu Park		mona.rizvi@nu.edu.kz	TBD
Course Instructor(s)	Jurn Gyu Park Dimitrios Zorbas		jurn.park@nu.edu.kz dimitrios.zorbas@nu.edu.kz	TBD
Teaching Assistant(s)	TBD		TBD	TBD

8. Course Outline

Session	**Date** (tentative)	**Topics and Assignments**	**Course Aims** (ref. # only, see item 4)	**CLOs**
Week 1	1/11 ~ 1/15	OS Overview. (C / Linux commands)	2	1 - 7
Week 2	1/18 ~ 1/22	Processes	2	1 - 7
Week 3	1/25 ~ 1/29	Threads	2	1 - 7
Week 4	2/1 ~ 2/5	Scheduling (W4/5: Quiz1)	1,2	1 - 7
Week 5	2/8 ~ 2/12	Linux Scheduling	1,2	1 - 7
Week 6	2/15 ~2/19	Synchronization I: Mutex	1,2	1 - 7
Week 7	2/22 ~ 2/26	Synchronization II: Semaphore	1,2	1 - 7
Week 8	3/1 ~ 3/5	Review and Overview (W7/8: Midterm)	1,2	1 - 7
Week 9	3/8 ~ 3/12	Synchronization III: (Applications)	1,2	1 - 7
Week 10	3/15 ~3/19	Deadlocks (W10/11: Quiz2)	1	1 - 7
Week 11	3/29 ~4/2	Memory Management I: Main Memory	1, (2)	1 - 7

Week 12	4/5 ~ 4/9	Memory Management II: Virtual Memory1	1, (2)	1 - 7
Week 13	4/12 ~ 4/16	Memory Management II: Virtual Memory2	1, (2)	1 - 7
Week 14	4/19 ~ 4/23	File Systems, I/O systems and Device Drivers, Research Issues on OS & Summary	1	1 - 7

9.	**Learning and Teaching Methods**
1	Lecture/demonstration by teacher
2	Lab exercises in peer groups
3	Individual programming assignments

10. Summative Assessments (tentative)

#	**Activity**	**Date**(tentative)	**Weighting (%) (tentative; +/- 5% adjustable)**	**CLOs**
	Programming Assignments + (Practice: no grading)	2 (+ 1 or 2)	20%	1 – 7
	Tests/Quizzes	Week 4/5, 10/11	20% (or 30%)	1 - 7
	Attendance	W1 - 14	N/A	1 - 7
	Mid Exam	Week 7	30% (or 20%)	1 - 7
	Final Exam	Exam week	30%	1 - 7

11. Grading

Letter Grade	**Percent range**	**Grade description** (where applicable)
A	95-100	See Section 6 of "Academic Policies and Procedures for Undergraduate Programs" (available at https://registrar.nu.edu.kz/policies-and-procedures)
A-	90-94.9	
B+	85-89.9	
B	80-84.9	
B-	75-79.9	
C+	70-74.9	
C	65-69.9	
C-	60-64.9	

D+	55-59.9	
D	50-54.9	
F	0-49.9	

12.	**Learning resources** (use a full citation and where the texts/materials can be accessed)

E-resources, including, but not limited to: databases, animations, simulations, professional blogs, websites, other e-reference materials (e.g. video, audio, digests)	On-line digital material: on Moodle
E-textbooks	Suggested: **Operating Systems Concepts** by Silberschatz or/and **Modern Operating Systems** by Tannenbaum. For systems programming, Advanced Programming in the UNIX Environment by Stevens
Laboratory physical resources	**Linux lab computers** (N/A for Distance Learning)
Special software programs	Linux-based Laptop **(multi-boot Linux** or **Linux on Virtual Machine**), **Ubuntu 16.04/18.04** is recommended
Journals (inc. e-journals)	N/A
Textbooks	Suggested: **Operating Systems Concepts** by Silberschatz or/and **Modern Operating Systems** by Tannenbaum. For systems programming, Advanced Programming in the UNIX Environment by Stevens

13.	**Course expectations**

Class Structure

The class meets for one lecture and 2 lab sessions per week. The labs will feature exercises that illustrate the concepts and techniques covered in the lectures.

Attendance at class sessions is compulsory. Students who miss assignments or exams for medical reasons are required to submit a doctor's note and make individual arrangements for make-ups, if possible. Arrangements for make-ups for other types of emergencies or conflicts should be discussed with the instructor as early as possible. Please refer to the new attendance policy at the Registrar's site for more details.

Lab exercises are designed to help students practice the current material and may be done and submitted in pairs or larger groups, depending on the assignment. Discussion with classmates, the instructors and the TAs is encouraged during these exercises. Homework assignments and projects are individual work. Quizzes and tests/exams are always individual work.

Materials will be disseminated to the students using moodle (moodle.nu.edu.kz), and most assignments will be submitted using moodle. Announcements will be posted in moodle and sent in email.

Student Behavior

Students are expected to maintain respectful decorum in the classroom and laboratories, and in all interactions with fellow classmates, Teaching Assistants, Research Assistants and NU faculty and staff. Class time is short, and valuable, and thus should be used effectively; students are expected to refrain from such distractions as texting, phone calls, on-line chats, personal web browsing, the use of social networking sites, and excessive chatting or greetings during class time.

Students should come to class well-prepared, having completed the background reading and related assignments, and possessing proper resources for the class meeting (books, paper, writing implements, computers, etc.), as needed.

14. Academic Integrity Statement

Nazarbayev University and The School of Science and Technology have established high standards for academic integrity, using an approach in which students are trained to produce original work according to professional standards, and to properly cite and reference the work of others when it is appropriate to do so.

The specific guidelines are published in the NU Student Handbook. In particular,

- The assignments in this class are designed to introduce important concepts and techniques, and enable you to explore the material independently so as to gain insight and comprehension of the subject. Doing the work is much more important than getting the right answer.
- The course is designed such that the new material presented each lesson builds on the skills developed in the preceding days; thus, any action that interferes with this process (e.g., skipping lesson exercises, copying) will seriously impede your progress.
- You are welcome—and encouraged—to talk through concepts and ideas with your fellow students and to study with them, but do not give or receive direct help from your classmates on graded exercises.
- **Assignments should be completed individually. If you distribute or allow others to look at your work, even if you are not intending them to copy it, this is still considered academic misconduct.**
- Even the appearance of cheating or inappropriate copying should be avoided.
- Students should be aware that the code submission process incorporates an automated plagiarism detector.
- You may only get help on graded work from designated people—the instructors, TAs, or lecturers for the course. If you are struggling with something, by all means, please seek help from them.

In the event that academic misconduct such as plagiarism or cheating is discovered, the student will receive no credit for the work, and the event reported to the Dean of your school. Egregious cases, or a second offense, can result in failure of the course and potential suspension or expulsion from the university.

When a student suspects that another student has violated the academic honesty policy, a report should be made to the appropriate faculty member.

15. E-Learning

16. Approval and review

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Date of Approval:	**Minutes #:**	**Committee:**
Date(s) of Approved Change:	**Minutes #:**	**Committee:**