Operating Systems Design

Course Code:

CSE 331

Course Period:

Spring

Course Type:

Core

Credits:

4

ECTS:

7

Prerequisite Courses:

Data Structures [1]
Systems Programming [2]
Course Language:

English

Course Coordinator:

Şebnem Baydere [3]
Courses given by:

Şebnem Baydere [3]
Course Objectives:

The goal of the course is to study general design principles of modern operating systems(OS) and concurrent programming.

Course Content:

OS concepts that are fundamental to the ability to effectively maintain and trouble-shoot system problems that arise during normal application development, fundamental OS kernel components and their design principles with hands on experience on a real operating system.

Course Methodology:

Teaching Methods: 1: Lecture, 2: Question-Answer, 3: Lab

Course Evaluation Methods:

Assessment Methods: A: Testing, B: Experiment, C: Homework, D: Term Project

Learning Outcomes	Program Outcomes	Teaching Methods	Assessment Methods
1. Knowledge of process management component design principles and ability to design synchronization primitives under realistic hardware constraints and conditions	3,4	1,2,3	A, C, D
2. Knowledge of memory management component design principles for virtual memory systems	3,4	1,2	A, C, D
3. Knowledge of file system component design principles and secondary storage management issues	3,4	1,2	A, C, D
4. Knowledge and ability to use modern design techniques for the design of kernel system calls supporting multi-processing and multi-threading systems	3,4,5	1,2,3	A, C, D
5. Knowledge and ability to use modern operating system components and tools for the design of multi-threaded concurrent systems with realistic constraints in real life applications.	3,4,5	1,2,3	C, D
6. Ability to conduct experiments, gather data, analyze and interpret results for investigating engineering solutions to OS kernel design problems.	5	3	C, D
7. Ability to work efficiently in intra-disciplinary teams and to work individually.	6	3	A, C, D

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Lab
Assessment Methods:	A: Testing, B: Experiment, C: Homework, D: Term Project

OURSE CONTENT

Week	Topics	Study Materials
1	Introduction and historical perspective	
2	Processes and Threads: creation and dispatching, context switch	
3	Cooperating vs Independent Processes, IPC, Atomic Operation, Race Condition	
4	Synchronization Problem: Mutual Exclusion, Critical Section, Implementing Locks	
5	Classical IPC Problems, bounded buffers, Synchronization: Scheduling Constraints, Semaphores	
6	CPU Scheduling	
7	Midterm I	
8	Monitors, Condition Variables, Deadlocks	
9	Memory Management: Contiguous Allocation, Protection with Base & Bound Registers, Segmentation, Paging, Translation Lookaside Buffers	
10	Virtual Memory, Demand Paging, Page Replacement, Thrashing, Working Set	
11	Secondary Storage Management, Disk Allocation, Disk Scheduling	
12	Midterm II	
13	File Systems: Naming and Directories	
14	Atomic Transactions, Protection and Security	

RECOMMENDED SOURCES

Textbook	A.Silberschatz et al, “Operating System Concepts”, Addison Wesley
Additional Resources	Lecture Notes: http://cse.yeditepe.edu.tr/v2/en/academic/course-pages [4] Lab material: http://cse.yeditepe.edu.tr/v2/en/academic/course-pages [4] A. Tanenbaum, “Modern Operating Systems”, Prentice Hall G. Nutt, “Operating Systems, Addison Wesley

ASSESSMENT

IN-TERM STUDIES	NUMBER	PERCENTAGE
Mid-terms	2	57
Quizzes	2	7
Assignment	3	21
Term Project	1	15
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		30
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		70
Total		**100**

COURSE'S CONTRIBUTION TO PROGRAM

No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied information in these areas to model and solve engineering problems.	X				
2	Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.	X				
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose					**X**
4	Ability to devise, select, and use modern techniques and tools needed for engineering practice; ability to employ information technologies effectively.					**X**
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating engineering problems.					**X**
6	Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.					**X**
7	Ability to communicate effectively both orally and in writing; knowledge of a minimum of one foreign language.		X			

8	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.		X	
9	Awareness of professional and ethical responsibility.			X
10	Information about business life practices such as project management, risk management, and change management; awareness of entrepreneurship, innovation, and sustainable development.	X		
11	Knowledge about contemporary issues and the global and societal effects of engineering practices on health, environment, and safety; awareness of the legal consequences of engineering solutions.		X	

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Including the exam week: 16x Total course hours)	14	5	70
Hours for off-the-classroom study (Pre-study, practice)	14	4	56
Mid-terms	2	5	10
Homework	3	4	12
Term Project	1	20	20
Final examination	1	10	10
Total Work Load			178
Total Work Load / 25 (h)			7,12
ECTS Credit of the Course			7