Concurrent Programming

Course Code:

CSE 472

Course Period:

Spring

Course Type:

Area Elective

Credits:

3

Theoric:

3

Practice:

0

Laboratory Hour:

0

ECTS:

5

Prerequisite Courses:

Operating Systems Design [1] Course Language:

English

Course Coordinator:

<u>Mustafa B. Mutluoğlu</u> [2] Courses given by:

<u>Mustafa B. Mutluoğlu</u> [2] Course Objectives: The aim of this course is to provide students with the necessary techniques to write efficient concurrent programs and tackle the challenges faced during this process.

Course Content:

The course contents include: review of multithreading concepts, processes and threads, synchronization, tackling safety and liveness problems, concurrent data structures.

Course Methodology:

1: Lecture, 2: Question-Answer, 3: Lab, 4: Case-study

Course Evaluation Methods:

A: Testing, B: Experiment, C: Homework, D: Project

Course Learning Outcomes	Program	Teaching Methods	Assessment Methods	
	Learning Outcomes	Methods	Methods	
1) Basic knowledge of processes and threads, multithreading concepts, synchronization primitives.	1	1,2	A, C	
2) Ability to write concurrent object oriented programs.	1,2	1,2	A, C, D	
3) Ability to understand, analize and derive solutions for safety problems in concurrent programs.	2,3	1,2	A, C, D	
4) Ability to understand, analize and derive solutions for liveness problems in concurrent programs.	2,3	1,2	A, C, D	
5) Ability to use concurrency libraries effectively.	4	1,2	A, C, D	
6) Ability to design and use concurrent data structures.	2,3	1,2	A, C, D	

COURSE CONTENT

Week	Topics	Study Materials
1	Review of Concurrency Concepts: Processes, Threads	Textbook
2	Review of Concurrency Concepts: Synchronization	Textbook
3	Concurrent Object Oriented Programming	Textbook

4	Safety: Safe Objects, Immutable Objects	Textbook
5	Safety: Full Synchronized and Partially Synchronized Objects	Textbook
6	Liveness: Liveness Failures	Textbook
7	MIDTERM EXAM I	Textbook
8	Liveness: Removing or Splitting Synchronization	Textbook
9	Java Concurrent Package; Executors, Thread Pools	Textbook
10	Java Concurrent Package; Queues, Concurrent Collections	Textbook
11	Concurrent Data Structures	Textbook
12	Concurrent Data Structures	Textbook
13	MIDTERM EXAM II	Textbook
14	Concurrent Data Structures	Textbook

RECOMMENDED SOURCES

Textbook	Lecture Notes: <u>http://cse.yeditepe.edu.tr/v2/en/academic/course-pages</u> [3]
Additional Resources	Concurrent Programming in Java, Doug Lea

MATERIAL SHARING

Documents

Assignments

Exams

ASSESSMENT

IN-TERM STUDIES	NUMBER	PERCENTAGE
Mid-terms	2	60
Assignments	5	25
Term Project	1	15
Total		100

COI OVE	NTRIBUTION OF FINAL EXAMINATION TO ERALL GRADE		35			
COI GR/	NTRIBUTION OF IN-TERM STUDIES TO OVERALL ADE		65			
Tota	al		10	0		
COI	JRSE'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.					Х
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.					
6	Ability to work efficiently in intra-disciplinary and multi- disciplinary teams; ability to work individually.					
7	Ability to communicate effectively both orally and in writing; knowledge of a minimum of one foreign language.					
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.					
9	Awareness of professional and ethical responsibility.					
10	Information about business life practices such as project management, risk management, and change management; awareness of entrepreneurship, innovation, and sustainable development.					

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.

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 12x Total course hours)	12	3	36
Hours for off-the-classroom study (Pre-study, practice)	14	3	42
Midterm examination	2	1,5	3
Homework	5	3	15
Project	1	30	30
Final examination	1	1,5	1,5
Total Work Load			127,5
Total Work Load / 25 (h)			5,1
ECTS Credit of the Course			5