MARMARA UNIVERSITY - FACULTY OF ENGINEERING

2017-2018 Fall

CSE4038 Introduction to Parallel Processing

COURSE DESCRIPTION FORM

Offering Department	Department of Computer Engineering		Technical Elective
Course Code	CSE4038		
Course Name	Introduction to Parallel Processing		
Language of Instruction	English		
ECTS	5		
Contact Hours	Theoretical (T): 3	Practice (P): 0	Laboratory(L): 0
Pre-requisites			
Instructor	**Name**		
	E-mail		
Course Materials	**Mandatory**	Introduction to Parallel Computing, Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta 2003, Pearson, 2nd edition	
	Recommended	An Introduction to Parallel Programming, Peter Pacheco, 1st Edition, 2011	
Course Objectives	Objective of this course is to teach students parallel algorithm development techniques for memory and message passing models, parallel algorithms of basic problem classes, complexity and performance models.		
Course Content	Parallel computing models: shared memory space, message passing architectures, PRAM model. Complexity analysis and performance analysis, running time, upper and lower bound, speed up, cost and efficiency for Parallel Algorithms. Main auxiliary algorithms: broadcast, multicast, prefix. Parallel algorithms for main problem classes: sampling, sorting, combining, searching, matrix and graph algorithms		
Learning Outcomes	**LO1**	Ability to define and analyse PRAM and message passing architecture related models.	
	LO2	Ability to evaluate cost, speed up and efficiency of different parallel algorithms developed for a specific problem.	
	LO3	Understand structures and working principles of parallel algorithms belonging to specific problem class like sorting, sampling, searching, matrix operations etc.	
	LO4	Ability to develop new parallel algorithms for previously unexamined problems by applying parallel algorithm developing techniques	
	LO5	Adaptation and implementation of parallel algorithms into different programming environments (MPI, OpenMP etc)	

Program Outcomes		**LO1**	**LO2**	**LO3**	**LO4**	**LO5**		
PO2	Ability to identify, formulate, and solve complex engineering problems (a); ability to select and apply proper analysis and modelling methods for this purpose (b).	a	a	a	a, b	b		
PO3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way so as to meet the desired result (a); ability to apply modern design methods for this purpose (b).				a	b		
PO4	Ability to devise (a), select, and use (b) modern techniques and tools needed for engineering practice (1); ability to employ information technologies effectively (2).					1b, 2		

	No	**Week**	**Subjects**	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**		
Subjects (Knowledge, Skills and Behaviours), **Contributions of Subjects to Learning Outcomes,** **Assessment Methods**	**S1**	1	Introduction to parallel algorithms, application fields	MF						
	S2	2	Parallel processing models: shared memory space, message passing architectures, PRAM model.	MF	MF					
	S3	3	Complexity analysis and performance analysis, running time, upper and lower bound, speed up, cost and efficiency for Parallel Algorithms.	MF	MF					
	S4	4	Main auxiliary algorithms: broadcast, multicast, prefix, allsums.		MF					
	S5	5	Sampling problem – sequential and parallel solution algorithms		MF	MF	MF	P		
	S6	6 -7	Combining problem – parallel solution algorithms in CREW, EREW models.		MF	MF	MF	P		
	S7	8 - 9	Sorting problem – parallel solution algorithms in CREW-EREW models		MF	MF	MF	P		
	S8	10 - 11	Searching problem – Multiple search, tree and mesh architecture search		MF	MF	MF	P		
	S9	12	Matrix operations		MF	MF	MF	P		
	S10	13-14	Parallel graph algorithms		MF	MF	MF			

Assessment	**No**	**Type**	**Weight**	**Implementation Rule**	**Make-up Rule**

Methods and Weights	**MF**	Midterm Final	70%	There will be a midterm and a final exam. Exams will be taken as closed books and lecture notes. Calculator is allowed.	Marmara University regulations will be followed for make-up exams.
	P	Project	30%	An application selected from a problem class is implemented using parallel programming techniques (MPI, OpenMP).	
	TOTAL		100%		

Determining Letter Grades

- The letter grades will be determined based on the midterm and final exams and project.
- In order to determine the letter grade, a curve or catalog based method will be followed based on the total average scores of the students.
- The final exam score and the total average score of the student must be at least 35 to pass the course.
- According to Marmara University Undergraduate regulations, the weight of the final exam must be at least 40 out of 100.

Assessment	Midterm	Project	Final	TOTAL
Weight	30	30	40	100

Teaching Method, Student Work Load

Tme Applied by Instructor			
No	**Method**	**Explanation**	**Hours**
1	Lectures	Lectures are given in class using the board or via presentations. Example questions are solved to enhance the concepts.	14x3=42
2	Problem Session/ Practice	Problems related to the course topics are solved on the board.	-
3	Laboratory	Experiments are done in the laboratory or theoretical concepts covered during the lectures are practiced using computer exercises.	-
4	Interactive Courses	Questions are asked to students during lectures and they are encouraged to guess the answers (peer learning is also in this category)	-
5	Field Work	Students attend activities outside the campus.	-
6	Midterm	Midterm exam is given during the midterm week.	2
7	Final	Final exam is given during the final exam week.	2
Estimated Time to be Allocated by a Student			
8	Project	The students carry out research about the problem given in the project, design and implement their solution and prepare a report.	40
9	Homeworks	The students solve the problems given as homework.	
10	Pre-class learning of Course Material	The students study and learn the new subjects from course materials.	
11	Review of Course Material	Students review the course subjects from course materials to prepare for the exams and homeworks.	35
12	Office Hour	Students ask questions to the instructor or the assistant during office hours.	2
TOTAL			123

Academic Honesty

Violations of scholastic honesty include, but are not limited to cheating, plagiarizing, fabricating information or citations, facilitating acts of dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students.

In case academic dishonesty is observed, the first authority is the instructor of the course. The instructor may decide to give the student zero for the homework(s)/lab(s)/exam(s), give the letter grade FF, or may take disciplinary action.