ATILIM UNIVERSITY

Parallel and Cluster Computing (CMPE 575) Course Details

Course Name	Course Code	Term	Lecture Hours	Application Hours	Lab Hours	Credit	ECTS
Parallel and Cluster Computing	CMPE 575	Both	3	0	0	3	5

Pre-requisite Course(s)	

Course Language	English
Course Type	Elective Courses Taken From Other Departments
Course Level	Fen Bilimleri Yüksek Lisans
Mode of Delivery	Face to Face
Learning and Teaching Strategies	Lecture
Course Coordinator	

Course Lecturer(s)	
Course Assistants	
Course Objectives	TheThe objective of this course is to teach parallel/cluster computer architectures and their organization. This course also aims at teaching different programming paradigms for parallelizing engineering problems.
Course Learning Outcomes	The students who succeeded in this course; • Recognize parallelism in computational problems • Explain different parallel systems and their classification • Design parallel algorithms for different applications • Implement parallel algorithms using different programming environments such as MPI and OpenMP.
Course Content	Models of parallel computing - dependence on architecture, trade-off between computation cost and communication cost, performance measures for parallel computation - computational complexity, techniques for parallel computation - divide and conquer, partitioning, and pipelining, parallel algorithms for sorting, searching and matrix computations, MPI and OpenMP environments for parallel programming.

Weekly Subjects and Releated Preparation Studies

Week	Subjects	Preparation
1	Introduction to parallel/cluster computing.	Ch 1.1 of the main text
2	Parallel computing platforms 1	Ch 1.2

3	Parallel computing platforms 2	Ch 1.3-1.4-1.5
4	Parallel algorithm design principles 1	Ch 4, Ch 3 – other resources 1
5	Parallel algorithm design principles 2	Ch 4, Ch 3 – other resources 1
6	Parallel algorithm design principles 3	Ch 4, Ch 3 – other resources 1
7	Synchronous Computations	Ch 6
8	Analytical models for parallel programming 1	Ch 5 – other resources 1
9	Analytical models for parallel programming 2	Ch 5 – other resources 1
10	Message Passing with MPI 1	Ch 2, Ch 6 – other resources 1
11	Message Passing with MPI 2	Ch 2, Ch 6 – other resources 1
12	Developing parallel programs with MPI	Ch 10-11, Ch 2, Ch 8-9-10 – other resources 1
13	OpenMP programming 1	Ch 8 – other resources 5
14	OpenMP programming 2	Ch 8 – other resources 5
15	Review	
16	Review	

Sources

Course Book:	1. “Parallel Programming: Techniques & Applications Using Networked Workstations & Parallel Computers”, 2nd. Edition, B. Wilkinson Michael Allen, Pearson, 2005
Other Sources:	1. “Introduction to Parallel Computing”, 2nd Edition, A. Grama, A. Gupta and G. Karypis, V. Kumar Addison-Wesley 2003.
	2. http://www.hku.hk/cc/sp2/ftp/mpi/MPI_ug_in_FORTRAN.doc

	3. "Using MPI - 2nd Edition: Portable Parallel Programming with the Message Passing Interface (Scientific and Engineering Computation)", William Gropp, 1999
	4. "Parallel Programming With MPI", Peter Pacheco, Morgan Kaufmann, 1997
	5. “Using OpenMP: Portable Shared Memory Parallel Programming (Scientific and Engineering Computation)”, Barbara Chapman, Gabriele Jost, Ruud van der Pas, The MIT Press, 2007.

Evaluation System

Requirements	Number	Percentage of Grade
Attendance/Participation	-	-
Laboratory	-	-
Application	-	-
Field Work	-	-
Special Course Internship	-	-
Quizzes/Studio Critics	-	-
Homework Assignments	-	-
Presentation	-	-
Project	1	30
Seminar	-	-
Midterms Exams/Midterms Jury	1	30
Final Exam/Final Jury	1	40
Total	3	100

Percentage of Semester Work	60
Percentage of Final Work	40
Total	100

Course Category

Core Courses	
Major Area Courses	X
Supportive Courses	
Media and Managment Skills Courses	
Transferable Skill Courses	

The Relation Between Course Learning Competencies and Program Qualifications

#	Program Qualifications / Competencies	Level of Contribution				
		1	2	3	4	5
1	An ability to apply knowledge of mathematics, science, and engineering.			X		

2	An ability to design and conduct experiments, as well as to analyze and interpret data.		X			
3	An ability to design a system, component, or process to meet desired needs.		X			
4	An ability to function on multi-disciplinary domains.					
5	An ability to identify, formulate, and solve engineering problems.			X		
6	An understanding of professional and ethical responsibility.					
7	An ability to communicate effectively.					
8	Recognition of the need for, and an ability to engage in life-long learning.					
9	A knowledge of contemporary issues.				X	
10	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.			X		
11	Skills in project management and recognition of international standards and methodologies		X			
12	An ability to produce engineering products or prototypes that solve real-life problems.		X			
13	Skills that contribute to professional knowledge.					
14	An ability to make methodological scientific research.					
15	An ability to produce, report and present an original or known scientific body of knowledge.					
16	An ability to defend an originally produced idea.					

ECTS/Workload Table

Activities	Number	Duration (Hours)	Total Workload
Course Hours (Including Exam Week: 16 x Total Hours)	16	3	48
Laboratory			
Application			
Special Course Internship			
Field Work			
Study Hours Out of Class	16	2	32
Presentation/Seminar Prepration			
Project	1	15	15
Homework Assignments			
Quizzes/Studio Critics			
Prepration of Midterm Exams/Midterm Jury	1	15	15
Prepration of Final Exams/Final Jury	1	20	20
Total Workload			130