

Course name: CENG 443 Parallel Programming II				Department: Computer Engineering				
Semester	Methods of Education							Credit (ECTS)
	Practice	Recitation/ (Etud)	Lab	Project/ Field Study	Homework	Other	Total	
2021 – 2022 Fall	42	-	-	40	30	38	150	5
Language	English							
Compulsory/Elective	E							
Prerequisites	-							
Face to Face Lecture	2							
Online	1							
Course Contents	Week-1 Problems in Scientific Computing Week-2 Computer Architectures Week-3 Parallelization and Programming Models Week-4 Parallel Algorithm Concepts Week-5 Parallel Programming with MPI and OpenMP Week-6 Basics of Numerical Matrix Analysis Week-7 Dense Matrices, BLAS Week-8 Solving Dense Linear Systems, LAPACK Week-9 Midterm Exam Week-10 Sparse Matrices Week-11 Solving Sparse Linear Systems Week-12 Graphs and Graph Partitioning Week-13 Communication Minimization and Load Balancing Week-14 Hypergraphs and Hypergraph Partitioning Week-15 Applications in real-world environment							
Course Objectives	<ul style="list-style-type: none"> • An understanding of parallel solution methods for big scientific problems • An understanding of designing and analyzing parallel algorithms and getting experience on parallel systems. • An understanding of Problem decomposition, graph partitioning, and load balancing • An understanding of Single-processor performance, memory hierarchy, and pipelines • An understanding of message passing and shared memory paradigms 							
Learning Outcomes and Competences	This course covers concepts of efficient usage of supercomputers to resolve big scientific problems in the areas of Life Sciences, Physics, Climate research, Engineering. This course also covers basic concepts of dense parallel matrix computations and algorithms, sparse parallel matrix computations and algorithms, graphs and graph partitioning, hypergraphs and Hypergraph partitioning, the architectural features of parallel processors, memory hierarchy and programming models, task decomposition and design of parallel algorithms, basic communication operations and their implementation on various network topologies and performance analysis of parallel algorithms.							
Textbook and /or References	<ul style="list-style-type: none"> • Parallel Scientific Computing, Frédéric Magoulès François, Xavier Roux, Guillaume Houzeaux • Scientific Computing An Introductory Survey, Michael T. Heath • An Introduction to Parallel Programming, Peter Pacheco • Numerical Linear Algebra for High-Performance Computers, Dongarra, Duff, Sorensen, Van der Vorst 							
Assessment Criteria							%	
	Midterm						30	
	Quiz						10	
	Homework						10	
	Project						20	
Final						30		
Instructors	Dr. F. Şükrü Torun							