PARALLEL PROGRAMMING WITH GPU

1	Course Title:	PARALLEL PROGRAMMING WITH GPU	
2	Course Code:	BM6030	
3	Type of Course:	Optional	
4	Level of Course:	Third Cycle	
5	Year of Study:	1	
6	Semester:	2	
7	ECTS Credits Allocated:	6.00	
8	Theoretical (hour/week):	3.00	
9	Practice (hour/week):	0.00	
10	Laboratory (hour/week):	0	
11	Prerequisites:	None	
12	Language:	Turkish	
13	Mode of Delivery:	Face to face	
14	Course Coordinator:	Prof. Dr. KEMAL FİDANBOYLU	
15	Course Lecturers:	-	
16	Contact information of the Course Coordinator:	e-posta: kfidan@uludag.edu.tr Uludağ Üniversitesi, Bilgisayar Mühendisliği Bölümü Görükle Kampüsü, 16059 Nilüfer, Bursa	
17	Website:		
18	Objective of the Course:	In this course, the use of GPU in solving problems that require high performance will be explained. Studies on solving which types of problems with the GPU and which ones on the computer will be included. In this context, current issues in parallel and GPU computing, the basis of parallel algorithms, GPU programming model, parallel computing patterns, optimization and GPU application examples will be covered.	
19	Contribution of the Course to Professional Development:	Engineering Science: 85%; Engineering Design: 15%	
20	Learning Outcomes:		
		1	Define parallel programming with GPU
		2	Understand data parallel computing and scalable parallel execution methods
		3	Understand memory, data location, performance and numerical concepts in parallel programming
		4	Understand the concepts of convolution, prefix summation, histogram computation and sparse matrix computation in parallel models
		5	Understand CUDA dynamic parallelism
		6	Examine case studies in parallel programming
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		10	
21	Course Content:		

Course Content:

Week	Theoretical	Practice
1	Introduction to parallel programming with GPU.	

2	Data parallel computing.	
3	Scalable parallel execution.	
4	Memory and data locality.	
5	Performance considerations.	
6	Numerical considerations.	
7	Parallel patterns: convolution: An introduction to stencil computation.	
8	Parallel patterns: prefix sum: An introduction to work efficiency in parallel algorithms.	
9	Parallel patterns—parallel histogram computation: An introduction to atomic operations and privatization.	
10	Parallel patterns: sparse matrix computation: An introduction to data compression and regularization.	
11	Parallel patterns: merge sort: An introduction to tiling with dynamic input data identification.	
12	Parallel patterns: graph search.	
13	CUDA dynamic parallelism.	
14	Application case studies.	

22	Textbooks, References and/or Other Materials:	Textbook: - David B. Kirk and Wen-mei W. Hwu, Programming Massively Parallel Processors: A Hands-on Approach, Morgan Kaufman, 2011. - H. Bidgoli, CUDA by Example: An Introduction to 2010. - NVIDIA Developer Zone,

23	Assesment				
Midterm Exam	1	20.00	Activites	Number	Duration (hour)	Total Work Load (hour)
Home work-project	1	20.00	Theoretical	14	3.00	42.00
Total	3	100.00	Practicals/Labs	0	0.00	0.00
Success Grade			Self study and preperation	14	5.00	70.00
Contribution of Final Exam to Success Grade		60.00	Homeworks	1	33.00	33.00
Total		100.00	Projects	0	0.00	0.00
Measurement and Evaluation Techniques Used in the Course		Classical problem-solving ability will be measured in midterm and final exams. The project will include research, simulation, report writing and presentation on a subject related to the course content.	Field Studies	0	0.00	0.00
			Midterm exams	1	15.00	15.00
			Others	0	0.00	0.00
			Final Exams	1	20.00	20.00
			Total Work Load			180.00
			Total work load/ 30 hr			6.00
			ECTS Credit of the Course			6.00

24	**ECTS / WORK LOAD TABLE**

25	CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS															
	PQ1	**PQ2**	**PQ3**	**PQ4**	**PQ5**	**PQ6**	**PQ7**	**PQ8**	**PQ9**	**PQ10**	**PQ11**	**PQ12**	**PQ13**	**PQ14**	**PQ15**	**PQ16**
ÖK1	5	5	4	4	3	5	0	0	0	0	0	0	0	0	0	0
ÖK2	5	5	4	4	3	5	0	0	0	0	0	0	0	0	0	0
ÖK3	5	5	4	4	3	5	0	0	0	0	0	0	0	0	0	0
ÖK4	5	5	4	4	3	5	0	0	0	0	0	0	0	0	0	0
ÖK5	5	5	4	4	3	5	0	0	0	0	0	0	0	0	0	0
ÖK6	5	5	4	4	3	5	0	0	0	0	0	0	0	0	0	0
LO: Learning Objectives PQ: Program Qualifications																
Contribution Level:	**1 very low**		**2 low**		**3 Medium**		**4 High**			**5 Very High**						