COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2025/2026 SEMESTER 1.

Course title	*Parallel technologies 2*
Course Code	IVM328ANMI
Hours/Week: le/pr/lab	0/0/2
Credits	4
Degree Programme	Computer Science Engineering / MSc
Study Mode	
Requirements	exam
Teaching Period	Autumn
Prerequisites	Parallel algorithms and programming, IVM325ANMI
Department(s)	Department of System and Software Technology
Course Director	
Teaching Staff	*Dr. Peter Iványi*

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

This course is about CUDA programming on NVIDIA architectures.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

Students will learn to
1. Program a hybrid system
2. Program a GPU system in CUDA environment
3. Manage a hybrid memory architecture
4. Optimize a parallel program using efficient memory accesses

2. COURSE CONTENT

Neptun: Instruction/Subjects/Subject Details/Syllabus/Subject content

	TOPICS
LECTURE	
PRACTICE	
LABORATORY PRACTICE	1. *Introducing to GPU programming, First CUDA program* 2. *Practical tutorial, programming and compiling a CUDA program* 3. *Thread handling, 2D data structures, Matrix-matrix multiplication* 4. *Synchronization and description of GPU architecture* 5. *Debugging of CUDA programs, Retrieving GPU properties* 6. *Memory types, Memory access, More efficient matrix-matrix multiplication* 7. *Occupancy, profiling* 8. *Memory optimization, Warp and threads, granularity, timing* 9. *Raytracing,*

10. *Memory allocation techniques*
11. *Streams*
12. *OpenCL, OpenACC*

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

PRACTICE, LABORATORY PRACTICE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.				
2.	*Introducing to GPU programming, First CUDA program*	[1] – Chap 1,2,3		
3.	*Introducing to GPU programming, First CUDA program*	[1] – Chap 1,2,3		
4.	*Thread handling, 2D data structures, Matrix-matrix multiplication, Synchronization and description of GPU architecture*	[1] – Chap 4	HW 1.	Week 10
5.	*Thread handling, 2D data structures, Matrix-matrix multiplication, Synchronization and description of GPU architecture*	[1] – Chap 4		
6.	*Memory types, Memory access, More efficient matrix-matrix multiplication*	[1] – Chap 5		
7.	*Memory types, Memory access, More efficient matrix-matrix multiplication*	[1] – Chap 5		
8.	Break			
9.	*Memory optimization, Warp and threads, granularity, timing*	[1] – Chap 6,7		
10.	*Memory optimization, Warp and threads, granularity, timing*	[1] – Chap 6,7		
11.	*Memory allocation techniques*	[1] – Chap 8,9,10		
12.	*Streams, OpenCL, OpenACC*	[1] – Chap 14,15 [2]		
13.	Consultation			
14.				
15.				

3. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System)

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

Attendance at 70% of classes is mandatory. The participation rate does not affect the grade, but an absence of more than 30% results in the subject being failed.
Attendance is checked on the basis of an attendance sheet

ASSESSMENT

Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be deleted.

Course-unit with final examination

Mid-term assessments, performance evaluation and their weighting as a pre-requisite for taking the final exam

(The samples in the table to be deleted.)

Type	Assessment	*Weighting as a proportion of the pre-requisite for taking the exam*
1. *Homework 1*	*acceptance by lecturer*	*100%*

Requirements for the end-of-semester signature

(Eg.: mid-term assessment of 40%)

Homework must be submitted during the semester and the instructor must accept it in order to complete the signature. Incomplete or incorrect homework will be returned and they must be corrected and resubmitted.

Re-takes for the end-of-semester signature (PTE TVSz 50§(2))

The specific regulations for grade betterment and re-take must be read and applied according to the general Code of Studies and Examinations. E.g.: all the tests and the records to be submitted can be repeated/improved each at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.

There is always +1 week available for correcting the homework beyond the deadline.

Type of examination *(written, oral):* *…oral….*

The exam is successful if the result is minimum ***40*** ***%.*** *(The minimum cannot exceed 40%.)*

Calculation of the grade *(TVSz 47§ (3))*

The mid-term performance accounts for ***0*** %, the performance at the exam accounts for ***100*** % in the calculation of the final grade.

Calculation of the final grade based on aggregate performance in percentage.

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[1.] David B. Kirk, Wen-mei W. Hwu: Programming Massively Parallel Processors – A hands on approach, NVIDIA Corporation, 2010, ISBN: 978-0-12-381472-2

[2.] Steve Rennich: CUDA C/C++ Streams and Concurrency, PDF file