COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2025/2026 SEMESTER 2

Course title	***Parallel Technologies 1***
Course Code	**IVM327ANMI**
Hours/Week: le/pr/lab	***2/2/0***
Credits	***5***
Degree Programme	***Computer Science Engineering MSc***
Study Mode	***Full time***
Requirements	***Final examination***
Teaching Period	***2025/2026-2***
Prerequisites	
Department(s)	***System and Software Technologies***
Course Director	***Géza VÁRADY***
Teaching Staff	***Péter NOVÁK***

COURSE DESCRIPTION

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

The course is intended for master students on Computer Science Engineering program to conduct high level discussion and argument about parallel programming techniques of computer clusters. Finally, the parallel programming standard of distributed systems - OpenMPI - is introduced throughout practical examples.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

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

Upon completion of this course the student should be able to understand parallel execution environments, parallel programming patterns of distributed systems and limitations of parallel programming, write message passing parallel programs and analyze parallelization problems.

2. COURSE CONTENT

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

	TOPICS
LECTURE	1. *topic* 2. *topic* 3. *topic* 4. *etc.*
PRACTICE	1. *topic* 2. *topic* 3. *topic* 4. *etc.*

LABORATORY PRACTICE	1. *topic* 2. *topic* 3. *topic* 4. *etc.*

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

LECTURE

week	**Topic**	**Compulsory reading; page number (from ... to ...)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Course introduction, schedule and requirements.		...	...
2.	Introduction to MPI, establishing the environment	[1.] 7-12		
3.	Summation of elements	[1.] 12		
4.	Approximation of PI	[1.] 13-18		
5.	Approximation of PI	[1.] 13-18		
6.	Basic parallel techniques, loop-splitting, block scheduling, dynamic load-balancing	[1.] 21-31		
7.	Shortest path, graph coloring	[1.] 32-54		
8.	Shortest path, graph coloring	[1.] 32-54		
9.	Spring break			
10.	Plate-heating simulation	[1.] 70-81		
11.	Plate-heating simulation	[1.] 70-81		
12.	Mandelbrot set	[1.] 98-127		
13.	Mandelbrot set	[1.] 98-127		
14.	Mandelbrot set	[1.] 98-127		
15.	Project work evaluation			

PRACTICE, LABORATORY PRACTICE

week	**Topic**	**Compulsory reading; page number (from ... to ...)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Course introduction, schedule and requirements.			
2.	Introduction to MPI, establishing the environment			
3.	Summation of elements			
4.	Approximation of PI			
5.	Approximation of PI			
6.	Basic parallel techniques, loop-splitting, block scheduling, dynamic load-balancing			
7.	Shortest path, graph coloring			
8.	Shortest path, graph coloring			

9.	Spring break			
10.	Plate-heating simulation			
11.	Plate-heating simulation			
12.	Mandelbrot set			
13.	Mandelbrot set			
14.	Mandelbrot set			
15.	Project work evaluation			

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 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

Requirements for the end-of-semester signature

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

Project work

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.

Project work

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

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.] Várady, Zaványij: Introduction to MPI, Typotex 2014

RECOMMENDED LITERATURE AND AVAILABILITY

[2.] R. Chandra, L. Dagum, D. Kohr, D. Maydan, J. McDonald, R. Menon: Parallel Programming in OpenMP, Academic Press, 2001.

[3.] G. Em Karniadakis, R. M. Kirby II: Parallel Scientific Computing in C++ and MPI, Cambridge University Press, 2007.

[4.] B. Wilkinson, M. Allen: Parallel Programming, Techniques and applications using networked workstations and parallel computers, Pearson Prentice Hall, 2005.