

# Introduction to Programming on the GPU with CUDA

organized for

Researchers and Students (PhD, MSc)

July 4-5, 2017

The Graphics Processing Unit or GPU is nowadays a mainstream component in Scientific Computing. For relatively little money one can have supercomputer performance. However, some extra work has to be done to make an ordinary sequential program suitable for use on the GPU.

One of the most important tools for using GPUs is currently “CUDA” (Compute Unified Device Architecture). This is basically an extension to the C programming language, which can be used to program the GPU in an easy way. Another tool is OpenCL, but as this is less mature than CUDA and performs less on especially the newest GPUs, the focus will be currently on CUDA.

**Course goal** In this 2-day course we will explain the basic principles of GPU programming and we will let you practise with many examples on several types of GPUs in our labroom. After this course you should be able to make simple CUDA programs which can be run on a GPU.

**Preliminaries** We recommend having a (rudimentary) understanding of a C-like programming language, such as C++, Java or similar. Fortran or Python should be fine as well. Interest in iterative solvers can be helpful.

**Teachers** Prof.dr.ir. Kees Vuik, Ir. Kees Lemmens, and Dr. Matthias Möller

**Costs** For members of DCSE this course is free, TU Delft staff and students pay € 50,- for a single day and € 100,- for the full 2 days course. For other participants the costs are resp. € 200,- for 1 day and € 350,- for 2 days. This is mainly to cover expenses for the lunch and the course material.

**Location** EEMCS building, Mekelweg 4, Delft. Room HB 05.150 on floor 5.

## Schedule

	Day 1 Introduction	Day 2 Advanced
09:15–09:30	Arrival, coffee, tea	Arrival, coffee, tea
09:30–10:30	Parallel computing on GPUs KV	Solvers KV
10:45–11:30	GPUs: design and architecture KL	Lab 4: Shared memory, streams, atomics KL
11:45–12:30	Lab 1: CUDA introduction KL	Lab 5: Optimising code: Innerproduct KL
12:45–13:30	Lunch	Lunch
13:30–14:45	Lab 2: Using CuBlas, CuFFT KL	Lab 6: Unified memory, Dynamic Parallelism KL
15:00–16:30	Lab 3: Debugging and Profiling KL	Applications on GPU MM
16:30–17:00	Lab 3: Debugging and Profiling KL	Lab 7: Applications on GPU MM

**Notes** The number of participants is restricted to 20. This course is given roughly every quarter.

**Register** In order to attend this course please register at <https://www.aanmelder.nl/gpucourse201707>.

**More info** <http://www.cse.tudelft.nl>.

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