

# Programming on the GPU with CUDA

Two-day course for researchers, PhD and MSc students

November 11-12, 2024

**What is a GPU?** Nowadays the Graphics Processing Unit (GPU) is a mainstream hardware component in high-performance computing. For affordable budgets anyone can harness supercomputer performance. However, realizing efficient parallelism combines three knowledge areas: firstly, on the architecture and compute capabilities of the GPUs; then, on special constructs for programming a GPU-equipped computer; finally, on the special algorithms for performing logical and mathematical operations in parallel.

**What is CUDA?** CUDA stands for Compute Unified Device Architecture. It is a software-development tool kit for programming on the GPUs maintained by the mainstream manufacturer Nvidia. CUDA provides language extensions for C, C++, FORTRAN, and Python as well as knowledge-specific libraries. A single source code is then able to instruct the CPU and GPU alike. Also, CUDA-extended codes keep pace closely with the rapid developments in the underlying technology.

**Goals and prerequisites** To guide you in this development niche, the [Delft Institute for Computational Science and Engineering](https://www.tudelft.nl/en/department/computational-science-and-engineering/) (DCSE) offers a CUDA course every quarter. We will explain basic principles and advanced topics on GPU programming with CUDA. You will apply these notions in our labroom with hands-on examples. After this course you will be able to get simple CUDA programs running on a GPU-equipped computer. As prerequisite, a rudimentary understanding of programming languages like C++ or Java is ideal; that of FORTRAN or Python will be helpful too. Some interest in linear algebra and iterative solvers is a little advantage.

**Schedule and instructors** Prof Kees Vuik, Ir Kees Lemmens, Dr Matthias Möller of the Faculty of Electrical Engineering, Mathematics and Computer Science teach the course. For the schedule we refer to <https://www.tudelft.nl/en/evenementen/2024/dcse/courses/programming-on-the-gpu-with-cuda>.

**Location** Delft University of Technology, Faculty of Mathematics & Computer Science, Mekelweg 4, 2628 CD Delft. The classes are given in Building 36, ‘Penguin’ Laboratory Room (HB02.130).

**Costs and registration** For members of DCSE this course is free. TU Delft staff and students pay € 50 for a single day and € 100 for 2 days, for other participants the costs are € 200 for 1 day or € 350 including lunch and course material. Lunch, refreshments, lecture materials are included.

Please sign up at <https://www.tudelft.nl/en/evenementen/2024/dcse/courses/programming-on-the-gpu-with-cuda>

The maximum number of participants is 25.

**More info** The course’s splash page is <https://www.tudelft.nl/en/evenementen/2024/dcse/courses/programming-on-the-gpu-with-cuda>

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