Big data and cloud computing, multicore processors, heterogeneous accelerators, parallel computing are all emerging technologies that are crucial in many domains like the economic sectors, but also increasingly in the medical domain. The requirements of particular applications must be optimally supported, by selecting the right combination of hardware and software architectures for satisfying specific constraints with regard to performance, power and cost.

The Computer Engineering programme is unique in providing a holistic view of system design. An in-depth understanding of hardware and software is necessary to provide the enabling technology for new societal trends such as ubiquitous online presence and the Internet of Things.

You will learn about modern computer architectures and networks and how to explain processors and their ability to perform their calculations, in addition to suggesting methods for optimising these calculations.

The courses in the programme address the three different aspects of computer engineering: software design, hardware design and the integration of the two. Understanding the theories that underlie system software will help you to create software designs. In addition, the
Computer Engineering programme will prepare you for the engineering challenges that lie ahead.

Research Themes

There are five different research themes that drive many of the courses and that provide opportunities for a thesis project.

Quantum Computing is part of the QuTech research lab that aims to build a quantum gates based computer. We are looking at the different architectural design choices that depend on the underlying qubit technology, the encoding scheme chosen and the kind of logical qubit one wants to implement.

Big Data Architectures involves the design of cutting-edge high performance computing systems to address the current explosion of dataset sizes in a wide range of application domains.

Liquid Architectures involves the design of innovative reconfigurable processor architectures that change their characteristics dynamically based on the needs of the programmes they run.

Dependable Nano Computing is driven by technology scaling, globalization of IC supply chain and Internet of things, focuses on three topics: 1. Reliability (including modelling, monitoring, mitigation etc.) 2. Testability (including Fault Modeling and Design-for-

Testability for 3D stacked ICs and emerging memories) 3. Hardware security (including PUF technology, secure design, etc).

In-Memory Computing targets the development, design and the demonstration of a new architecture paradigm for big data problems. This research is based on the integration of the storage and computation in the same physical location (using a crossbar topology) and the use of non-volatile resistive-switching technology, based on memristors, instead of CMOS technology.

Master’s Thesis

The Master’s thesis project can be chosen between the spectrum of hardware and software and can be performed at a company, in a research facility or at the university. Some examples of recent graduation projects are:

Examples of Master’s Theses

• Acceleration of Cancer Diagnosis Algorithms on Super Computing FPGA Platforms
• GPU-Based Simulation of Brain Neuron Models
• Porting Linux to the rVEX Reconfigurable VLIW Softcore
• Hardware Acceleration of Shortread Mapping with the Burrows-Wheeler Aligner
• Interconnect Test for 3D Stacked Memories
• A Quantum Emulation Platform

For more information on all courses, please visit: www.studyguide.tudelft.nl