Master Programme Computer Engineering

Arjan van Genderen,
MSc. Coordinator CE
Faculty EEMCS, TU Delft
A.J.vanGenderen@TUDelft.nl

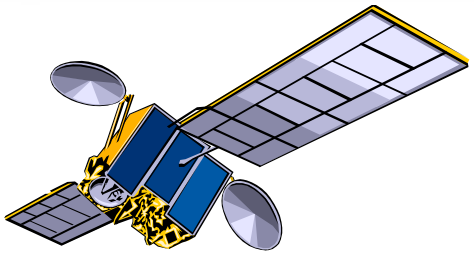
TU Delft

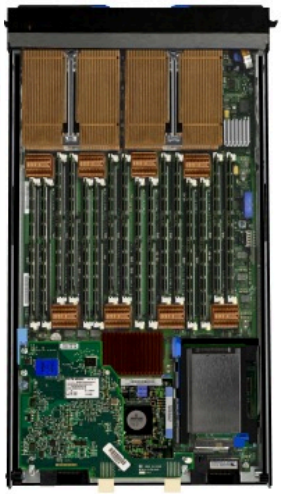
Outline

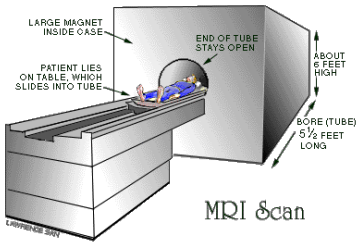
- What is Computer Engineering ?
- CE versus other MSc. programmes
- Curriculum MSc. CE
- CE research groups
- Thesis project
- Entry requirements
- Some statistics

Computer Engineering (CE) =

Putting software and hardware together to make computers







Hardware

Computer Arch., Logic design, Heterogeneous architectures, Quantum computing etc.

Software

Compilers, Operating Systems, Embedded Software,

Design tools & Methodologies

Design tools, Logic synthesis, HW/SW partitioning

Communication Networks

Network Arch., QoS, Mobile Networks, etc.

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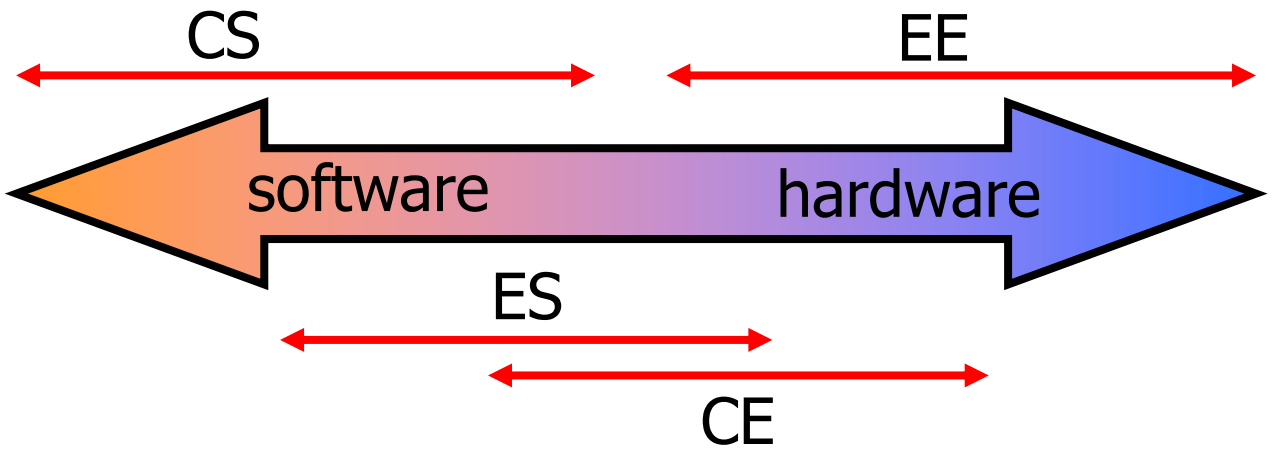
MSc. CE and ES versus other programmes



- As a CE student you will learn about software and hardware and you can specialize on many different CS and EE topics
- Compulsory courses CE and ES are different, pool of electives largely similar
- CE has a similar structure as EE programme

Curriculum Computer Engineering

First year			
Q1	Q2	Q3	Q4
Profile Orient. & Aca. Skills (3 EC)		Systems Engineering (3 EC)	
Common core course (5 EC)	Specialization (29 EC) and free elective (15 EC) courses		
Track core courses (20 EC)			
Second year			
1st semester		2nd semester	
Spec. and free electives continued	Thesis project (45 EC)		

Duration: 2 years (2 x 60 EC = 120 EC)

The Computer Engineering Programme

Compulsory
- Profile orientation and academic skills
- Systems Engineering

Common core (select at least 1)
- Statistical Digital Signal Processing and Modeling
- Control System Design
- Electromagnetics
- Networking
- Advanced Computing Systems
- Measurement and Instrumentation
- Analog Circuit Design Fundamentals

Track core (select at least 4)
- Modern Computer Architectures
- Introduction to High Performance Computing
- Methods and Algorithms for System Design
- Computer Arithmetic
- Processor Design Project
- Reconfigurable Computing Design
- Supercomputing for Big Data

CE Specialisation Courses

Specialization (select at least 29 EC)

- Fundamentals of Quantum Information
- Electronics for Quantum Computing
- VLSI Systems on Chip
- Digital IC Design I
- Digital IC Design II
- High-tech Start Ups
- Security and Cryptography
- Hardware Security
- Network Security
- Hardware Dependability
- Hardware Architectures for Artificial Intelligence
- Machine Learning 1
- Machine Learning 2
- Signal Processing for Communications
- High Performance Data Networking
- Ad-hoc networks
- Measuring and Simulating the Internet
- Performance Analysis
- Wireless Communication
- Wireless Networking
- Distributed Algorithms
- Cloud Computing
- Real-time Systems

Other MSc. EE or CS courses

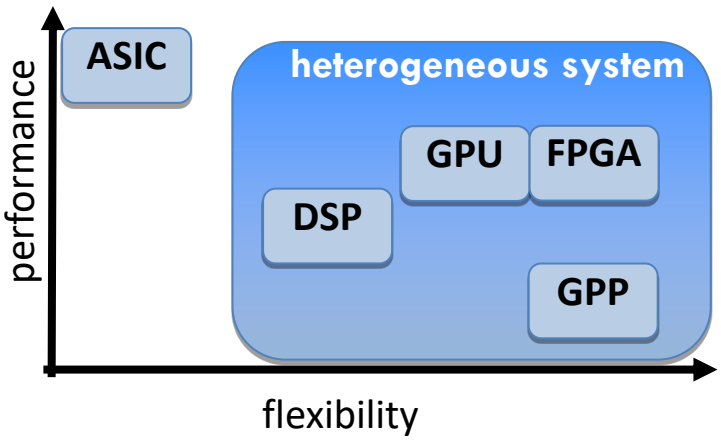
CE Free Elective Courses

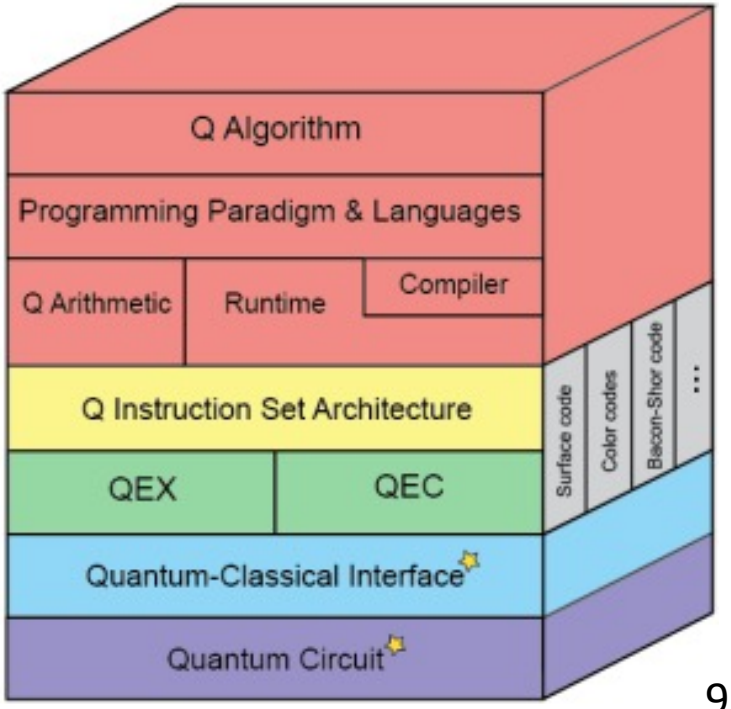
Free electives (max. 15 EC)

- Courses from other faculties / universities, e.g.
  - language courses (max. 6 EC)
  - business courses
- Homologation courses (max. 10 EC)
- Internship
- Extra Project
- Joint Interdisciplinary Project

Some CE Research Topics

- Heterogeneous multi-core systems
  - Which parts of the application will use which hardware resources ?
  - Run-time reconfiguration
- Hardware security
- In-memory computing
- Quantum computing
  - New logic building blocks and architectures are required to build Quantum computers.
  - Intel invested US$50 Million in TU Delft and TNO





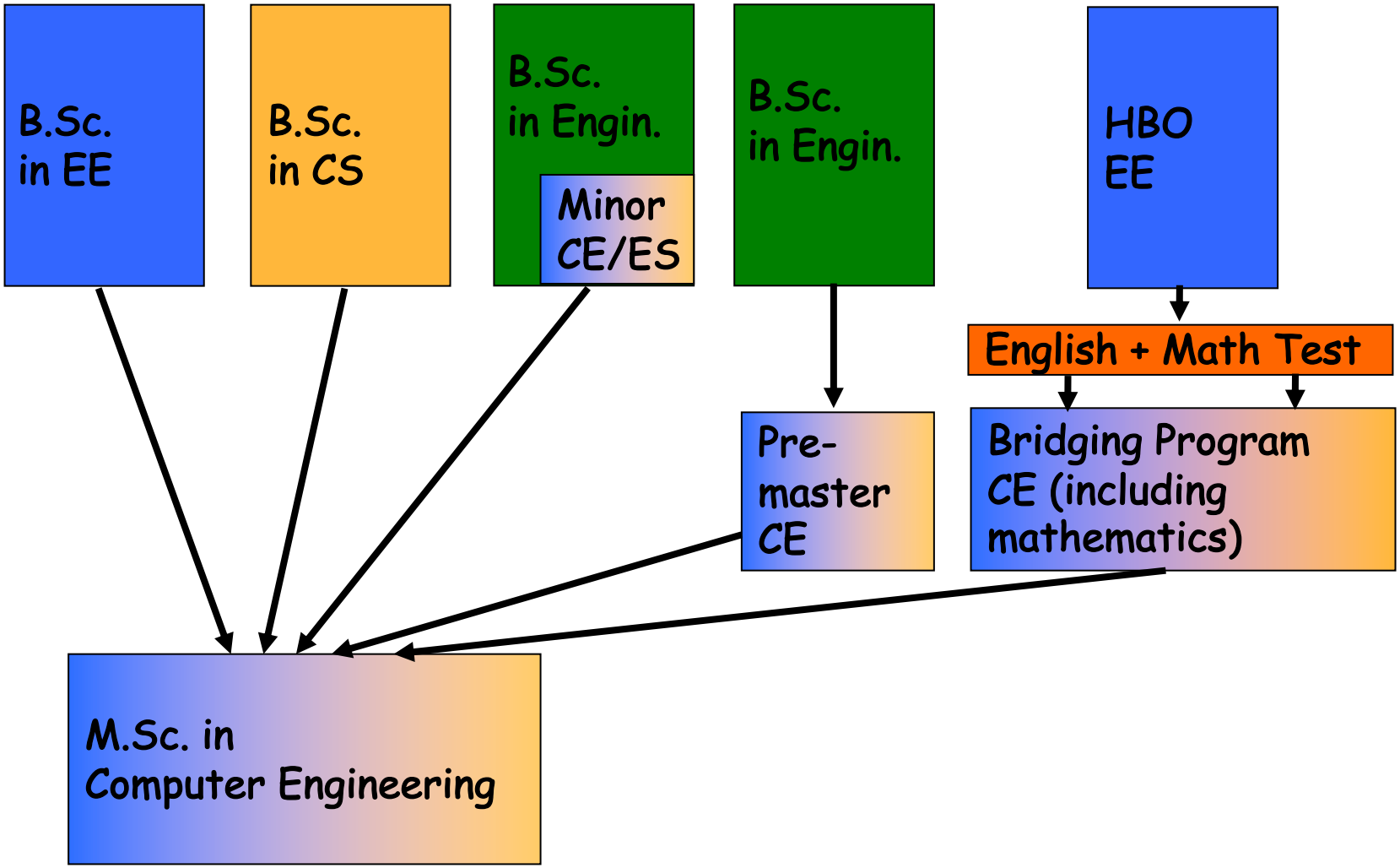
Research groups for thesis projects

Group	Department
Circuits and Systems	ME
Computer Engineering	Q&CE
Distributed Systems	ST
Embedded and Networked Systems	ST
Network Architectures and Services	Q&CE
Quantum Circuits Architecture & Technology	Q&CE
Software Engineering	ST

Some CE Thesis Projects

- Design for Testability for Secure ICs
- Interconnect Test for 3D Stacked Memories
- Porting Linux to the ρ-VEX reconfigurable VLIW softcore
- GPU-Based Simulation of Brain Neuron Models
- Libswift-PPSPP Information Centric Router: SHA1 Accelerator
- Fault-Tolerant On-Board Computer Software for the Delfi-n3Xt Nanosatellite
- Acceleration of Cancer Diagnosis Algorithms on Super Computing FPGA Platforms
- Acceleration of Big Data Algorithms for Behavioral Experiments
- A Quantum Emulation Platform

Entry Requirements



New students per year

	MSc. CE			
	total	NL	Int EU	Non EU
2013/2014	18	14	1	3
2014/2015	26	17	6	3
2015/2016	20	8	4	8
2016/2017	22	12	2	7
2017/2018	29	18	4	7
2018/2019	22	10	7	5
2019/2020	20	14	1	5

Who is employing our students?

- Philips
- NXP
- ASML
- Fox-IT
- Riscure
- Technolution
- Erasmus MC
- Ned. Octrooibureau
- TU Delft
- …

- ING
- Maxeler
- Intel
- Qualcomm
- Synopsys
- WhatsApp
- ARM
- Imagination Technologies
- CERN
- …

Thank you!

See also https://www.tudelft.nl/en/education/programmes/masters/computer-engineering/msc-computer-engineering/

and https://www.tudelft.nl/eemcs/the-faculty/departments/quantum-computer-engineering/computer-engineering/staff/arjan-van-genderen/

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