

Introductory Electronics (C003806)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0

Study time 180 h

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)

Dutch

Gent

lecture

independent work

practical

seminar

Lecturers in academic year 2024-2025

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TW06

lecturer-in-charge

Offered in the following programmes in 2024-2025

[Bachelor of Science in Computer Science](#)

[Preparatory Course Master of Science in Computer Science Engineering](#)

crdts

offering

6

A

6

A

Teaching languages

Dutch

Keywords

Analog and digital electronics, electrical networks, circuit analysis, circuit synthesis, signal representation, Shannon-Nyquist theorem, electrical interconnects, computer architecture, clock frequency, power consumption, scalability.

Position of the course

This course introduces the student into the electronic and technological foundations of modern information processing systems. It is indicated how the complex behaviour of such systems can be realised with simple electronic components. The emphasis is on the analysis and understanding of the observable properties and limitations of analogue and digital systems and commercial interconnect systems.

Contents

1 Basic concepts and building blocks.

- Maxwell equations and electrical currents in materials
- Electrical networks: concepts.
- Passive Building Blocks.
- Active Building Blocks.
- Network Analysis in the time domain.
- Network Analysis in the frequency domain.

2 Information in digital systems

- Analog vs. digital systems
- Noise
- Distortion

3 Digital Technology and Circuits.

- Basic CMOS Components.
- Logic Circuits and memories.

4 Interconnections

- Basic Interconnect Properties.
- Interconnect Systems.

5 Fabrication and design.

- The VLSI process.
- Impact on computer architecture design.

Initial competences

To understand electronic concepts, a basic knowledge of mathematics (algebra, linear differential equations, complex numbers and Fourier transforms) and of physics (electricity) is required. The students have acquired sufficient mathematical background during the first two years of the bachelor program. The basic concepts of electricity may have been part of the student's secondary school physics program, but they will be revised in this course. For the macroscopic building blocks of computer systems, this course will refer to the computer architecture course of the second bachelor year.

Final competences

- 1 Analyse simple linear electrical networks, both in the time domain and in periodic regime. Understand the static and dynamic behaviour of linear and some non-linear electronic components and of the MOSFET, as well as their implications on, e.g., the delay of interconnections and the power dissipation in computers.
- 2 Understand how the complex building blocks of modern computer systems can be realised with basic electronic components. Understand the observable properties and limitations of processors and commercial interconnect systems. Be aware of the fundamental limitations of information processing and communication systems that arise from the physical origin of electronics.
- 3 Analyzing and solve simple problems in analogue and digital electronics on the basis of technical information on the used equipment, software, and electronic components.
- 4 Integrate, interpret and compare results and information obtained through theoretical models and through simulations and practical experiments based on solid scientific electrotechnical methods.
- 5 Write reports and make judgement calls about theoretical models and practical experiments, and communicate conclusions, underlying knowledge and scientific arguments in a concise, scientific manner.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture, Practical, Independent work

Extra information on the teaching methods

E-learning platform Ufora: distribution of supplementary learning material, online discussion forum, assignments labs and handing in reports. Labs are group work (2 students per group) if the number of students is high, otherwise the lab assignments are done individually. Labs require work by the students on their own outside the contact hours. Other work on their own: solving and studying exercises with complete solutions or partial solutions (intermediate and final results to be obtained by students als self-test). Youtube channel with videos explaining solutions. Classical guided exercise sessions (students solve solutions in plenary session) and PC-class exercises.

Study material

Type: Syllabus

Name: Introductory Electronics

Indicative price: € 9

Optional: yes

Language : Dutch

Number of Pages : 198

Oldest Usable Edition : 2021-2022

Available on Ufora : Yes

Online Available : Yes

Available in the Library : No

Available through Student Association : Yes

Additional information: Only a Dutch version is available, which is distributed by the student organisation VTK.

Type: Slides

Name: Introductory Electronics

Indicative price: Free or paid by faculty

Optional: no

Language : Dutch

Number of Slides : 478

Oldest Usable Edition : 2023-2024

Available on Ufora : Yes

Online Available : Yes

Available in the Library : No

Available through Student Association : No

References

Course content-related study coaching

- Interactive classroom lectures.
- Feedback during seminar and practicum.
- Individual coaching by teacher/assistants if necessary (by appointment).
- Interaction via Ufora and MS Teams chats
- Example complete solutions and partial solutions
- Youtube channel with explanations solutions
- Q&A and supervised solutions exercises

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Oral assessment, Participation, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

Permanent evaluation first exam period:

Evaluation of the written reports of lab practica and the methodology and planning, extended with oral evaluation of the participation and understanding of required knowledge in the lab sessions or after the submission of the report.

Not being present at an evaluated lab or PC class session without proper ground or reason will result in a zero mark for that part of the permanent evaluation.

Submitting reports past the deadline results in lowered scores.

Students participate to the labs in groups of two or individually, depending on the total number of students. If performed in group, in a peer assessment the students will score each other in terms of their contribution to different aspects of the preparation, execution, and reporting of the labs. If it is clear that the contribution of the two students differs significantly, they will get a different score. Otherwise they get the same score.

Collaboration between multiple groups for a lab, against the rules for this course, will result in a zero mark for that at least that part of the permanent evaluation.

Periodic evaluation first exam period:

The closed-book written exam consist of two parts: theory and exercises.

Second exam period:

The exam is now partially oral (lab part is oral, theory and exercises are written), but still closed book, except for the lab reports the students have submitted during the semester. Besides the theory and exercise parts, there is also a third part on the labs.

Regarding the latter, the labs can not be reorganized in the second examination period in case they include a practical lab part. The evaluation of the lab reports from the first period is therefore used again, in combination with an additional oral

examination regarding the knowledge and capabilities gathered through the labs. The old mark and the new examination have the same weight for this part of the evaluation.

Calculation of the examination mark

In both periods, the theory and exercise parts of the exam each constitute 1/3 of the total score. The remaining part comes from the lab reports and evaluation. In the second period, the additional examination during the exam regarding the gathered knowledge and capabilities of the labs is accounted as described above. Students that miss a hardware lab session for a legitimate reason will have to catch up and do the activities on a later date. Missing a hardware lab session for no legitimate reason results in a zero score for that entire lab assignment (i.e., including the software part of that assignment).

To pass the evaluation successfully, students need to obtain at least 8/20 for each of the three scoring parts (theory, exercises, labs). If this is not the case, an average score of 10/20 or more is reduced to a final score of 9/20.

Facilities for Working Students

Option to be freed from presence in labs with alternative assignment after consultation with the responsible teacher. Option for oral exam with written preparation at another time in the academic year. Option for feedback by appointment during and after business hours.