

# Electrical Engineering and Electronics 1 (EEE1)

## Student Group

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# Electrical Engineering and Electronics 1 (EEE1)

You already know V-I-R and you not only connect AC/DC with music?  
Great! Then you should Go one step further.

This course introduces the fundamental principles of electrical engineering and electronics. It spans from basic electrical quantities to DC networks, electrostatics, magnetostatics, and a first introduction to operational amplifiers. The course combines theory, worked examples, and practical exercises with simulations and real-world devices.

## Block plan

[Introduction in Electrical Engineering 1](#)

**Chapter 1 —  
Electrical  
Fundamentals** or:  
Watt is Power and  
Current?

- [Block 01 —  
Physical  
Quantities and  
Units](#)
- [Block 02 —  
Electric Charge,  
Current and  
Voltage](#)
- [Block 03 —  
Resistance and  
Power](#)

**Chapter 2 — DC  
Networks** or:  
something lumpy with  
two Pins and why  
shortcircuits may be  
important

- [Block 04 —](#)

**Chapter 3 — Electric  
Fields** or: positivity  
might be repulsive

- [Block 09 — Force  
on Charges and  
electric Field  
Strength](#)
- [Block 10 — Field  
Patterns of key  
Geometries](#)
- [Block 11 —  
Influence and  
Displacement  
Field](#)
- [Block 12 —  
Capacitors and  
Capacitance](#)
- [Block 13 —  
Capacitor Circuits  
and Energy](#)
- [Block 14 —  
Steady  
Conduction Field](#)

**Chapter 4 —**

**Chapter 5 —  
Operational  
Amplifiers** - golden  
rules and infinite gain

- [Block 21 — Op-  
Amp Basics](#)
- [Block 22 —  
Negative-  
feedback Op-  
Amp Circuits](#)
- [Block 23 —  
Comparator  
Circuits](#)
- [Block 24 — Wrap-  
up and  
Applications](#)

**Kirchhoff's Laws**

- Block 05 — Resistive Networks
- Block 06 — Real Sources and Source Equivalents
- Block 07 — Power-relevant Figures
- Block 08 — Two-terminal Theory and Transforms

**Magnetic Fields** or:

Why ist the north pole on the south pole?

- Block 15 — Magnets and their Effects
- Block 16 — Fields of current-carrying Conductors
- Block 17 — Ampère's law and MMF
- Block 18 — Magnetic Flux Density and Forces
- Block 19 — Magnetic Circuits and inductance
- Block 20 — Electromagnetic Induction and Energy

[old English exams](#)

## Learning outcomes

After completing this course, students will be able to:

1. Apply SI units, prefixes, and electrical terminology consistently.
2. Explain and calculate fundamental electrical quantities such as charge, current, voltage, resistance, power, and energy.
3. Analyze DC circuits using Kirchhoff's laws, source equivalents, and two-port theory.
4. Describe electric and magnetic fields, calculate key field distributions, and apply them to capacitors, inductors, and energy storage.
5. Design and analyze simple operational amplifier circuits with feedback and comparator functions.

## Prerequisites

1. Basic physics (mechanics, Newton's laws, Coulomb's law).
2. Basic calculus (differentiation and integration).
3. Familiarity with algebraic manipulation.

## Grading and assessment

Assessment is done only by the final written exam.

## Additional Links

### English

- [Electrical Engineering - Fundamentals](#): A great, compact textbook covering about the same range as this course. (Use University VPN to get the textbook)
- [Circuit Analysis and Design](#) is a beautifully written and illustrated textbook with the same range of topics like this course. (It is also free to download - after filling in your data - and used in many US universities.)
- A great introductory script into electrical engineering can be found at [LibreText - Physics II Thermodynamics, Electricity and Magnetism](#). The content is originally from [OpenStax](#) and covers most of the parts of my course
- Another good introduction is given by [HyperPhysics](#)
- Alternatively, Tony R. Kuphaldt developed a very detailed and easy booklet on EEE1 and EEE2: [online version](#)  
[PDF for EEE1](#), [PDF for EEE2](#), [PDF for semiconductor part](#)

### German

- [Online Brückenkurs des KIT/Uni Stuttgart](#): Nice, partly animated online script
- [H.Er.T.Z der HS Karlsruhe](#): The [Hochschuloffene Elektrotechnik Zentrum](#) of the Karlsruhe HS has a nice [online script](#)
- [LeifiPhysik](#): Here you can find further explanations of our chapters on vocational school/gymnasium level.
- [simple club](#): explanatory videos on electrical engineering in the field of physics ; subscription not necessary!
- [Elektrotechnik einfach erklärt](#): still few, but well developed videos
- [Elektrotechnik in 5 Minuten](#): good fund of short videos

## Exercises

- In addition to the H.Er.T.Z script (see above), there are further [exercises](#).
- Further exercises will be distributed via ILIAS

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