

| Module title | | SM Code |
|------------------------------------------------------|---------------------------------------------------|--------------|
| Material Science | | WT |
| Module lecturer | Faculty | |
| Prof. Dr. Corinna Kaulen | Electrical Engineering and Information Technology | |
| Module language | Number of SWS / WSH | ETCS credits |
| English | 3 SWS / WSH | 3 |
| Teaching format | | |
| Seminar-based teaching with approx. 25-30% exercises | | |

| Semester according to the study plan | |
|-----------------------------------------------------------------------|------------------------------------------------------------------------|
| 2 nd semester (Bachelor) | |
| Attendance/classroom hours | Additional independent study |
| 42 hours | Preparation and follow-up work: 20 hours Exam preparation: 28 hours |
| Type of examination / Requirements for the award of the credit points | |
| Written exam: 90 minutes | |

| Teaching content |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Material structures: <ul style="list-style-type: none"> • Atomic structure according to Bohr-Sommerfeld • Crystalline structures and their description • Lattice defects and their effects • Homogeneous and heterogeneous microstructures, phases • Alloys, phase diagrams • Description of amorphous structures |

Material properties:

- Mechanical properties
- Electrical properties
- Magnetic properties
- Thermal properties
- Optical properties

Materials used in electrical engineering:

- Conductor, resistor, and contact materials
- Semiconductor materials
- Dielectrics
- Magnetic materials
- Optical materials

Learning objective: Professional competence**After successfully completing this module, students will be able to**

- describe the basic structure of materials (1) and explain its connection to material properties and functional mechanisms (2)
- describe the possibilities and limitations of optimizing and utilizing material properties under technical constraints (2)
- name the diverse materials used in electrical engineering and their further development (1)
- formulate material requirements using the relevant parameters and their limits (2), and evaluate them (3)
- select materials appropriate for specific applications (3)
- explain (1), evaluate (2) and discuss (3) material-based effects and functions of electrical engineering components

Literature**Recommended reading**

- Fischer, H., Hofmann, H., & Spindler, J. (2007). *Werkstoffe in der Elektrotechnik*. Hanser-Verlag

- Ivers-Tiffée, E., & von Münch, W. (2007). *Werkstoffe der Elektrotechnik*. Vieweg+Teubner Verlag

The numbers in brackets indicate the levels to be achieved: (1)-know | (2)-can | (3)-understand and apply