Module title		SM Code
Electronic Components		**BE**
Module lecturer	**Faculty**	
N.N.	Electrical Engineering and Information Technology	
Module language	**Number of SWS / WSH**	**ETCS credits**
English	4 SWS / WSH	5
Teaching format		
Seminar-based teaching with 10-15% practical component		

Semester according to the study plan	
3rd semester	
Attendance/classroom hours	**Additional independent study**
56 hours	Preparation and follow-up work: 94 hours
Type of examination / Requirements for the award of the credit points	
Written exam: 90 minutes	

Teaching content

Fundamentals of semiconductor physics:

- Semiconductor materials
- Crystal structure, carrier densities, conduction mechanisms
- Electrical properties (drift current, diffusion current)
- Compensation processes in the event of thermal equilibrium disruption
- Strip model

Diode:

- Basic structure and behavior without external voltage
- pn junction in forward and reverse bias
- Dynamic behavior, breakdown mechanisms
- Static and dynamic models
- Simple applications
- Technological implementation
- Types of diodes

Bipolar transistor:

- Basic functionality
- Technological structure
- Current equations, operating modes
- Basic circuits
- Characteristic values and characteristic curves
- Temperature and breakdown behavior
- Static and dynamic models
- Simple applications

Field effect transistor:

- MOS capacitor
- MOS and junction field-effect transistor
- Technological structure
- Principle of reactive power control
- Parameters and characteristic curves
- Static and dynamic models
- Applications Power MOSFET, IGBT

Learning objective: Professional competence

After successfully completing this module, students will be able to

- Present important fundamentals of semiconductor physics (2)
- Analyze the functioning of diodes, bipolar transistors, and field-effect transistors based on their internal structure (3)
- Interpret the parameters and characteristic curves of the components (3)
- correlations between technological and electronic parameters of components (2)
- Understand and apply models for describing static and dynamic behavior (3)
- Perform absolute and comparative evaluations of electronic components based on manufacturers' data sheets (2)
- Select suitable electronic components for specified requirements (2)

Literature

Recommended reading

- Müller R.: Fundamentals of Semiconductor Electronics (book series "Semiconductor Electronics, Volume 1), Springer-Verlag, 1995
- Müller R.: Components of Semiconductor Electronics (book series "Semiconductor Electronics, Volume 2), Springer-Verlag, 1991
- Sze S.M., Li, Y., Ng K.K.: Physics of Semiconductor Devices, Wiley, 2021
- Hoffmann K., System Integration - From Transistors to Large-Scale Integrated Circuits, Oldenbourg, 2011
- Tietze U., Schenk C.: Semiconductor Circuit Technology, Springer Verlag, 2019

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