Module title		SM Code
Electrical Engineering 2		**GE2**
Module lecturer	**Faculty**	
N.N.	Electrical Engineering and Information Technology	
Module language	**Number of SWS / WSH**	**ETCS credits**
English	8 SWS / WSH	8
Teaching format		
Seminar-based teaching with 10-15% practical component		

Semester according to the study plan	
3rd semester	
Attendance/classroom hours	**Additional independent study**
112 hours	Preparation and follow-up work: 128 hours
Type of examination / Requirements for the award of the credit points	
Written exam: 120 minutes	

Teaching content

- Stationary electric current field, electrostatic field, and switching processes

  Basic concepts: electric field, voltage, potential, permittivity, current density, capacitance, electric flux (density), displacement current (density), influence, and polarization. Calculation of electrostatic fields using Gauss's law and calculation of electric current fields. Energy and forces in the electrostatic field. Conductors and non-conductors in electrostatic fields and behavior of fields at interfaces. Switching processes in circuits with capacitors.

- Alternating current networks

  Basic concepts: complex currents and voltages, phasor diagram, complex resistance, complex power, active and reactive power Calculation of currents, voltages, and powers in networks with multiple sources and passive components. Calculation and construction of locus curves Technical resistors, capacitors, and coils in alternating current: parameters, equivalent circuits.

- Three-phase systems Calculation of currents, voltages, and power for symmetrical and asymmetrical loads in star and delta connections in a three- or four-wire network. Design of reactive power compensation

- Transformers Ideal transformer Real transformer taking into account stray losses and winding resistances: transformer equations, symmetrical and asymmetrical equivalent circuits, frequency response

- Resonant circuits

  Basic concepts: resonance frequency, cut-off frequency, bandwidth, quality factor, resonance boost Frequency response of series and parallel resonant circuits, Resonance of linear passive two-poles (resistance transformation, multiple resonances)

Learning objective: Professional competence

After successfully completing this module, students will be able to

- understand the basic concepts and physical laws of electric fields (Maxwell's equations) and alternating current circuits (1).
- apply the knowledge they have acquired to solve known types of problems in the field the electric field and the flow field (2): Calculation of local field quantities (D-field, E-field, and current density) and calculation of integral quantities (capacitance and resistance) for simple conductor arrangements. Calculation of the temporal course of the charging and discharging processes of capacitors.
- Apply the acquired knowledge to solve known types of problems in the field of alternating current networks (2): Calculate voltages, currents, and power in an electrical network with multiple sources and linear passive components. Construct locus curves and phasor diagrams. This applies in particular to three-phase systems, transformers, and resonant circuits.
- Using an understanding of the underlying physical laws to solve previously unknown problems in the field of electric fields and alternating current networks (3).

Literature

Recommended reading

- Führer, Heidemann, Nerreter: Fundamentals of Electrical Engineering, Vol. 1-3, Hanser-Verlag
- Hagmann: Fundamentals of Electrical Engineering, Aula-Verlag
- Pregla: Fundamentals of Electrical Engineering, Hüthig-Verlag
- Moeller, Fricke, Vaske, Frohne: Fundamentals of Electrical Engineering, Teubner-Verlag

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