

<b>Module description: Electronics 2</b>	
<b>Module Code</b>	t.BA.ET.EK2.19HS
<b>ECTS Credits</b>	4
<b>Language of Instruction/Examination</b>	German
<b>Organizational Unit</b>	ISC Signal & WCOM
<b>Module Coordinator</b>	Teddy Loeliger
<b>Legal Framework</b>	The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail.
<b>Module Characteristic</b>	Type 3a  2 lecture lessons per semester week and class+ 2 lab bi-weekly lessons per semester and half-class
<b>Module Description</b>	Students acquire the knowledge and skills required for the understanding, analysis and design of standard electronic circuits with discrete components. This includes a systematic approach to the calculation, simulation and optimisation of modern circuits.
<b>Module Content</b>	<ul style="list-style-type: none"> <li>• Based on exemplary electronic circuits in modern electronics modules, circuits are identified, analysed, and designed.</li> </ul> <p><b>The module includes the following topics:</b></p> <ul style="list-style-type: none"> <li>• Bipolar Transistors (principle of operation, characteristics, equivalent circuits)</li> <li>• Field-Effect Transistors (principle of operation, characteristics, equivalent circuits)</li> <li>• Transistor Amplifier Circuits</li> <li>• Current Sources and Current Mirrors</li> <li>• Real Operational Amplifiers (structure, non-idealities, differential amplifier)</li> <li>• Active Filters (filter theory, filter design, filter implementations)</li> <li>• Oscillators (feedback, LC oscillators, RC oscillators, crystal oscillators, multivibrators, ring oscillators)</li> </ul>
<b>Prerequisite Knowledge</b>	<ul style="list-style-type: none"> <li>• Properties and circuits with ideal operational amplifiers</li> <li>• Properties of diodes</li> <li>• Properties and behavior of field-effect transistors as switches</li> <li>• Simulations with LTspice</li> </ul>

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<b>Learning Objectives (Competences)</b>	<b>Students...</b>		<b>Competencies</b>	<b>Taxonomies</b>	
	You work in teams of two on the setup and analysis of practical electronic circuits and practice the ability to shape interpersonal processes in a situation-specific, goal-oriented and effective manner.		SO	K5	
	You can identify, analyze, dimension, build and test transistor amplifier circuits, current sources, current mirrors, and oscillators.		M, F	K1, K2, K3, K4	
	You know the basic filter approximations and can calculate, characterize, design and dimension active filters using filter tables.		F, M	K1, K2, K3, K4, K5	
	You are experienced in working with a circuit simulation tool and can check the simulation output results for plausibility.		M	K3, K6	
	You know the internal structure of an operational amplifier, its non-idealities, and can design a suitable operational amplifier circuit for a given application.		M, F	K1, K2, K3, K4, K5, K6	
	You can identify core relations and equations in electronic circuit areas, condense them concisely and apply them to the analysis of circuits.		SE	K4, K5	
	You know the characteristics of bipolar and field-effect transistors and can determine these properties by measurements and compare them with the data sheet information.		F, M	K1, K2, K3	
<b>Performance Assessment</b>	<b>End-of-module exam</b>	<b>Assessment</b>	<b>Length (min.)</b>	<b>Weighting</b>	<b>Form</b>
	written exam	Grade	90	80	acc. to module agreement
	<b>Performance assessment during the semester</b>	<b>Assessment</b>	<b>Length (min.)</b>	<b>Weighting</b>	<b>Form</b>
	written exam	Grade	40	20	acc. to module agreement
<b>Classroom Attendance Requirement</b>	None				
<b>Learning material</b>	<ul style="list-style-type: none"> <li>• Exercises (for self-study)</li> <li>• Lecture slides</li> <li>• Lab instructions</li> </ul>				
<b>Comments</b>	<b>Resources in the laboratory:</b> <ul style="list-style-type: none"> <li>• Circuit simulation tool (LTspice)</li> <li>• Laboratory infrastructure (electronic setups, measurement instruments)</li> </ul>				