

Department	06 Applied Sciences and Mechatronics
Course title	Design of Integrated Circuits
Hours per week (SWS)	4
Number of ECTS credits	6
Course objective	<p>After completing this module successfully, students have gained the following competencies:</p> <p>They have a deepened understanding of selected topics of modern highly integrated semiconductor technologies</p> <p>They know tools for the design of integrated circuits and can develop and simulate integrated circuits with multiple hierarchy levels</p> <p>They understand the basics of integrated circuit design and can design and simulate optimized integrated digital circuits</p> <p>They understand the circuit technology of analog components in CMOS-technology and can design, simulate, and optimize integrated circuits.</p>
Prerequisites	Basics of semiconductor physics
Recommended reading	<p>1. Baker, Li, Boyce, CMOS Circuit Design, Layout, and Simulation, IEEE Press, 2010.</p> <p>2. B. Razavi, Design of Analog CMOS Integrated Circuits.</p>
Teaching methods	Lectures and hands on training
Assessment methods	100% written examination: 90'
Language of instruction	English
Name of lecturer	Prof. Dr. Helmut Fischer, Prof. Dr. Ullrich Menczigar
Email	helmut.fischer@hm.edu; ullrich.menczigar@hm.edu
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Course content	<p>Full custom versus semicustom design.</p> <p>The MOSFET (a refresher), the FINFET.</p> <p>Leakage mechanisms and low power design.</p> <p>Basics of full custom digital design.</p> <p>Design for manufacturing: 6 Sigma design and verification strategies.</p> <p>Mask generation: Lithography and OPC (Optical Proximity Correction).</p> <p>Device reliability and integrated circuits durability.</p> <p>Special analog and digital functional blocks.</p> <p>Single stage amplifier (common source circuit, source follower)</p> <p>Differential amplifier (with passive resp. with active load)</p> <p>Frequency behavior of amplifiers (single stage amplifier and differential amplifier)</p> <p>Single stage and dual stage operational amplifiers</p> <p>Hands on training:</p> <p>Design and layout of a dual stage operational amplifier (Miller-OTA)</p> <ul style="list-style-type: none"> - Matching constraints in design and layout of operational amplifiers - Layout rules - Extraction of layout parasitics - Simulation including layout parasitics
Remarks	