

### 3.1.5 Design and Analysis of Integrated Circuits

#### Module title: Design and Analysis of Integrated Circuits

Module summary
Module code: EITM 220I
Module coordinator: Prof. Dr. Herman Jallli Ng
Credits (ECTS): 5 CP workload: in lecture 60 h, independent study time 90 h
Semester: 1 <sup>st</sup> or 2 <sup>nd</sup> semester
Pre-requisites with regard to content: Electronics, high-frequency techniques
Pre-requisites according to the examination regulations: none
Competencies: Upon successful completion the students, <ul style="list-style-type: none"> <li>• learn about modern semiconductor technologies that enable the implementation of highly integrated circuits</li> <li>• become highly proficient in advanced circuit techniques and high-frequency basics</li> <li>• are able to design and analyze various integrated circuit blocks using transistors and other semiconductor devices</li> <li>• know how to calculate all design parameters of the circuits</li> <li>• are able to optimize the performance of circuit blocks regarding gain, noise, stability, dynamic range, efficiency and total power consumption</li> </ul>
Assessment: Assessment is done by either a written exam (120 minutes) or an oral examination (20 minutes). The form of examination will be announced at the beginning of the semester
Usability: <i>General:</i> The module imparts knowledge of semiconductor technologies, microelectronics circuits, advanced transistor-level design techniques, integrated circuit building blocks and transceiver architectures. Critical design parameters of the integrated circuit building blocks are discussed and the optimization methods are introduced. Examples of highly integrated transceivers, high-frequency systems, various fully-integrated building blocks on transistor-level are presented in this module. <i>Connection with other modules:</i> Design and Analysis of Integrated Circuits require a comprehensive background in fundamental of electrical engineering as well as profound knowledge in electronic and semiconductor components as well as basic transistor circuits. Proficiency in high-frequency techniques are also required.

Course: Design and Analysis of Analog ICs
Module code: EITM 221I
Lecturer: Prof. Dr. Herman Jalli Ng
Contact hours: by arrangement
Semester of delivery: yearly, summer semester
Type/mode: lecture 2h/week; mandatory in the study field Information Technology, optional in the other study fields of the program
Language of instruction: English or German; the course language will be announced at the beginning of the semester

<p>Content:</p> <ul style="list-style-type: none"> <li>• Advanced Circuit Techniques</li> <li>• Review of Amplifiers</li> <li>• Frequency Response of Amplifiers</li> <li>• Noise</li> <li>• Feedback</li> <li>• Operational amplifiers</li> <li>• Oscillators</li> <li>• Phase-Locked Loops</li> </ul>
<p>Recommended reading:</p> <p>Razavi B.: Design of Analog CMOS Integrated Circuits, McGraw Hill Education, 2015</p> <p>Baker R.J.: CMOS Circuit Design, Layout and Simulation, Wiley-IEEE, 2010</p>
<p>Comments: -</p>

<p><b>Course: Design and Analysis of RF ICs</b></p>
<p>Module code: EITM 222I</p>
<p>Lecturer: Prof. Dr. Herman Jalli Ng</p>
<p>Contact hours: by arrangement</p>
<p>Semester of delivery: yearly, summer semester</p>
<p>Type/mode: lecture 2h/week; mandatory in the study field Information technology, optional in the other study fields of the program</p>
<p>Language of instruction: English or German; the course language will be announced at the beginning of the semester</p>
<p>Content:</p> <ul style="list-style-type: none"> <li>• Transceiver Architectures</li> <li>• High-Frequency Devices</li> <li>• S-Parameters and Impedance Matching</li> <li>• Low-Noise Amplifiers</li> <li>• Power Amplifiers</li> <li>• Mixers</li> <li>• Voltage-Controlled Oscillator</li> </ul>
<p>Recommended reading:</p> <p>Voinigescu S.: High-Frequency Integrated Circuits, The Cambridge RF and Microwave Engineering Series, 1st edition, 2013</p> <p>Razavi B.: RF Microelectronics, Prentice Hall, 2011</p> <p>Ellinger F.: Radio Frequency Integrated Circuits and Technologies, Springer, 2007</p>
<p>Comments: -</p>