

# Syllabus

## *Course Description*

<b>Course Title</b>	Electronic Devices
<b>Course Code</b>	42409
<b>Course Title Additional</b>	
<b>Scientific-Disciplinary Sector</b>	IINF-01/A
<b>Language</b>	English
<b>Degree Course</b>	Bachelor in Electronics and Cyber-Physical Systems Engineering
<b>Other Degree Courses (Loaned)</b>	
<b>Lecturers</b>	Prof. Luisa Petti, Luisa.Petti@unibz.it <a href="https://www.unibz.it/en/faculties/engineering/academic-staff/person/39580">https://www.unibz.it/en/faculties/engineering/academic-staff/person/39580</a> Prof. Dr. Niko Stephan Münzenrieder, Niko.Muenzenrieder@unibz.it <a href="https://www.unibz.it/en/faculties/engineering/academic-staff/person/42095">https://www.unibz.it/en/faculties/engineering/academic-staff/person/42095</a>
<b>Teaching Assistant</b>	
<b>Semester</b>	First semester
<b>Course Year/s</b>	2
<b>CP</b>	9
<b>Teaching Hours</b>	54
<b>Lab Hours</b>	36
<b>Individual Study Hours</b>	135
<b>Planned Office Hours</b>	27
<b>Contents Summary</b>	<p>The topics covered include:</p> <ul style="list-style-type: none"><li>• Physics of semiconductor materials (e.g., crystal structure, energy bands, density of states, dopants, electronic transport)</li><li>• Nanotechnology</li><li>• pn junctions and diodes</li><li>• MOSFETs</li><li>• JFETs</li></ul>

	<ul style="list-style-type: none"> <li>• Bipolar junction transistors</li> <li>• Optical devices</li> <li>• Sensors</li> </ul>
<b>Course Topics</b>	<p>The topics covered include:</p> <ul style="list-style-type: none"> <li>• Physics of semiconductor materials (e.g., crystal structure, energy bands, density of states, dopants, electronic transport)</li> <li>• Nanotechnology</li> <li>• pn junctions and diodes</li> <li>• MOSFETs</li> <li>• JFETs</li> <li>• Bipolar junction transistors</li> <li>• Optical devices</li> <li>• Sensors</li> </ul>
<b>Keywords</b>	<p>Electronic Devices      Semiconductors      Transistors      Sensors</p>
<b>Recommended Prerequisites</b>	<p>Mathematical Analysis I, Mathematical Analysis II, Physics I, Physics II</p>
<b>Propaedeutic Courses</b>	
<b>Teaching Format</b>	<p>Frontal lectures, homework, exercises, and laboratories.</p>
<b>Mandatory Attendance</b>	<p>Preferrable. Non-attending students should contact the lecturer at the start of the course to agree on the modalities of the independent study</p>
<b>Specific Educational Objectives and Learning Outcomes</b>	<p>The objective of this course is an understanding of the physics and operation of semiconductor devices. Specifically, understanding of the formation and behaviour of semiconductor contacts, basic knowledge of nanotechnology and microfabrication, understanding of operation and design of MOSFETs, bipolar transistors and JFETs, and understanding of other devices such as, optical devices and sensors.</p>
<b>Specific Educational Objectives and Learning Outcomes (additional info.)</b>	<p>Knowledge and understanding</p> <ol style="list-style-type: none"> <li>1. Have a solid knowledge of semiconducting materials and devices</li> <li>2. Know the concepts of semiconducting carrier transport and of device operation</li> </ol> <p>Applying knowledge and understanding</p> <ol style="list-style-type: none"> <li>3. Be able to design electronic devices and choose the proper</li> </ol>

	<p>materials for them</p> <p>4. Be able to properly use physical units</p> <p>Making judgements</p> <p>5. Be able to think “out-of-the-box” when facing problems and critical issues.</p> <p>Learning skills</p> <p>Develop learning capabilities and autonomous thinking in order to pursue effectively further studies.</p>
<b>Assessment</b>	<p>The exam will be in written form.</p> <p>Students will have the choice to take an oral midterm exam to earn a bonus of up to 5 points out of 30 for the final mark.</p> <p>The students might also have the possibility to substitute a part of the final exam with a group project to be carried out during the semester and concluded by an oral presentation</p>
<b>Evaluation Criteria</b>	<p>The assessment criteria will be the accuracy of the answers given in the written examination, with particular attention to the resolution procedure adopted and the formal correctness of the same.</p>
<b>Required Readings</b>	<p>Blackboard and lecture slides</p>
<b>Supplementary Readings</b>	<p>Various textbooks can be used as a reference, for example:</p> <ul style="list-style-type: none"> <li>· „Semiconductor Physics and Devices“, Donald A. Neamen</li> <li>· „Physics of Semiconductor Devices“, S. M. Sze and Kwok K. Ng</li> <li>· „Microelectronics“, Jacob Millman and Arvin Grabel</li> <li>· „The Art of Electronics“, Paul Horowitz and Winfield Hill</li> </ul>
<b>Further Information</b>	
<b>Sustainable Development Goals (SDGs)</b>	Quality education