

Department	06 Applied Sciences and Mechatronics
Course title	Structure-function relationship in electronic materials
Hours per week (SWS)	4
Number of ECTS credits	6
Course objective	<p>After completing this module successfully students possess or have improved their competencies in the following fields:</p> <ul style="list-style-type: none"> - They can mathematically describe the tensorial nature of material properties; - They can explain basic symmetry considerations; - They can point out the application of structure-function relations to static electric properties and to charge transport.
Prerequisites	Basics in mathematics, physics, especially solid state physics
Recommended reading	
Teaching methods	seminaristic teaching with exercises
Assessment methods	written exam, 90min
Language of instruction	English
Name of lecturer	Azza Hadj Youssef
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Link	
Course content	<ul style="list-style-type: none"> - Mathematical toolbox for elementary tensor calculus (0 to 4th rank) - Neumann's principle to relate symmetries to properties - Revisiting crystal classes and symmetries - Geometry factors: difference between device and material equations - Introduction of complex tensors <p>Applied aspects</p> <ul style="list-style-type: none"> - Each step of the lecture is motivated by examples. Once the students are acquainted with the required theoretical concepts, the lecture is dedicated to specific cases. Suggestions from students are welcome - Static electronic properties including dielectric, piezo-, pyro-, and ferroelectric properties - Hooke's law in 3D: stress, strain, shear etc. - Charge transport (Ohm's law, dielectric losses) and high frequency (optical) responses - Geometrically confined structures, the effect of dimensionality - Phase transitions and properties - Frustrated systems <p>The lecture only requires preliminary knowledge of basic matrix operations, it is not meant to be a mere theory lecture.</p>
Remarks	only in summer 2022