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| Data:                           | MechTest. MA. Nr. 3207 / Examination number: 50409                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Version: 05.04.2018 | Start Year: WiSe 2018 |
| Module Name:<br>(English):      | <b>Experimental Methods of Structure Characterization of Matters</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                       |
| Responsible:                    | <a href="#">Rafaja, David / Prof. Dr. rer. nat. habil.</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |                       |
| Lecturer(s):                    | <a href="#">Wüstefeld, Christina / Dr.-Ing.</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |                       |
| Institute(s):                   | <a href="#">Institute of Materials Science</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |                       |
| Duration:                       | 1 Semester(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                       |
| Competencies:                   | Students get familiar with basic principles and applications of selected methods for microstructure analysis of matters (mainly optical, scanning and transmission electron microscopy, diffraction methods) and learn how these methods can be used for analysis of the real structure of materials.                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                       |
| Contents:                       | <ul style="list-style-type: none"> <li>- Crystal symmetry operations, point and space groups in crystallography</li> <li>- Interaction of electrons, X-rays and neutrons with matter</li> <li>- Applications of optical, scanning and transmission electron microscopy, and X-ray, electron and neutron diffraction in the analysis of real structure and microstructure of matters: <ul style="list-style-type: none"> <li>- Phase identification and quantification, use of crystallographic databases</li> <li>- Determination of the grain and crystallite size,</li> <li>- Global and local preferred orientation of crystallites</li> <li>- Residual stress analysis</li> </ul> </li> </ul>                    |                     |                       |
| Literature:                     | <ul style="list-style-type: none"> <li>- L. Reimer: Scanning Electron Microscopy, Springer, Berlin 2010</li> <li>- V. Randle, O. Engler: Introduction to texture analysis, microtexture, microtexture and orientation mapping, Gordon &amp; Breach, Amsterdam, 2000.</li> <li>- H.P. Klug, L.E. Alexander: X-ray diffraction procedures for polycrystalline and amorphous materials, New York, Wiley, 2nd edition 1974.</li> <li>- C. Giacovazzo, H.L. Monaco, G. Artioli et al.: Fundamentals of Crystallography, IUCr Texts on Crystallography 15, 3rd edition, 2011</li> <li>- D.B. Williams, C.B. Carter: Transmission Electron Microscopy: A Textbook for Materials Science, Springer, New York 2016</li> </ul> |                     |                       |
| Types of Teaching:              | S1 (WS): Lectures (3 SWS)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                       |
| Pre-requisites:                 | <b>Recommendations:</b><br>Profound knowledge of English, basics in materials science, mechanics, advanced mathematics, physics for scientists.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |                       |
| Frequency:                      | yearly in the winter semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                       |
| Requirements for Credit Points: | For the award of credit points it is necessary to pass the module exam.<br>The module exam contains:<br>MP/KA (KA if 5 students or more) [MP minimum 30 min / KA 120 min]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                       |
| Credit Points:                  | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                       |
| Grade:                          | The Grade is generated from the examination result(s) with the following weights (w):<br>MP/KA [w: 1]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                       |
| Workload:                       | The workload is 120h. It is the result of 45h attendance and 75h self-studies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |                       |