



# Master in Life Sciences

A cooperation between  
BFH, FHNW, HES-SO, ZFH

<b>Module title</b>	<b>Surface Characterisation</b>
<b>Code</b>	C2
<b>Degree Programme</b>	Master of Science in Life Sciences
<b>Group</b>	Chemistry
<b>Workload</b>	3 ECTS (90 student working hours: 42 contact lessons = 32 h; 58 h self-study)
<b>Module Coordinator</b>	<b>Name:</b> Dr. Michael de Wild <b>Phone:</b> +41 (0)61 228 56 49 <b>Email:</b> <a href="mailto:michael.dewild@fhnw.ch">michael.dewild@fhnw.ch</a> <b>Address:</b> FHNW, Hochschule für Life Sciences, Hofackerstrasse 30, 4132 Muttenz
<b>Lecturers</b>	<ul style="list-style-type: none"> <li>• Dr. Michael de Wild, FHNW</li> <li>• Dr. Renzo Raso, FHNW</li> <li>• Dr. Patrick Shahgaldian, FHNW</li> </ul>
<b>Entry requirements</b>	<p>Scientific background in chemistry, physics and analytical chemistry. The students need a Bachelor in Materials Sciences, Chemistry, Physics, Engineering, Biomedical engineering or equivalent.</p> <p>Basic lectures on materials sciences, chemistry, physics and biomaterials are a prerequisite to follow this course.</p>
<b>Learning outcomes and competences</b>	<p>After completing the module, students will be able to:</p> <ul style="list-style-type: none"> <li>• explain in-depth modern microscopic and spectroscopic surface characterization techniques.</li> <li>• describe the importance of surface chemistry and the structural features of surfaces with regard to cell-surface interactions.</li> <li>• describe the principal methods of sample preparation for analytical techniques required to accurately analyze the surface.</li> <li>• select the right combination of surface analytical techniques to properly analyze the surface properties of various materials.</li> <li>• explain the most recent sensing strategies and detection principles in Life Sciences.</li> <li>• critically evaluate the scope and limitations of the applied methods, the range of sensitivity and the influence of disturbing factors on the results.</li> </ul>
<b>Module contents</b>	<ul style="list-style-type: none"> <li>• Electron microscopy (EM), incl. cryogenic EM, EDX and WDX Analysis</li> <li>• Scanning tunneling and atomic force microscopy techniques</li> <li>• Advanced confocal microscopy</li> <li>• White light interference microscopy,</li> <li>• Interpretation of microscopic and spectroscopic data</li> <li>• (FT) infrared and Raman spectroscopy, incl. confocal Raman microscopy, tip enhanced Raman spectroscopy</li> <li>• Surface ellipsometry (spectroscopic and imaging modes) and Brewster angle microscopy (BAM)</li> <li>• Interactions with surfaces (SPR, QCM, OWLS)</li> <li>• XPS and applications</li> <li>• Porosimetry: gravimetry, MIP, BET, <math>\mu</math>CT</li> <li>• Profilometry, 3D-SEM, confocal laser scanning microscope</li> <li>• Calometer, tribometer</li> </ul>

	<ul style="list-style-type: none"> <li>• Dynamic contact angle measurement</li> <li>• Non-destructive testing</li> </ul>
<b>Teaching / learning methods</b>	<p>Lecture and blended learning: <u>Contact lessons</u></p> <ul style="list-style-type: none"> <li>• Lectures, Q&amp;A-sessions</li> <li>• Group Exercises</li> <li>• Individual Project Studies</li> <li>• Demonstrations</li> </ul> <p><u>Self-study</u></p> <ul style="list-style-type: none"> <li>• Learning videos</li> <li>• interactive simulations (<a href="https://phet.colorado.edu/en/simulations/category/new">https://phet.colorado.edu/en/simulations/category/new</a>)</li> <li>• Individual Project Studies</li> </ul>
<b>Assessment of learning outcome</b>	1. Final written exam, closed book, (100%)
<b>Format</b>	7-weeks
<b>Timing of the module</b>	Autumn semester, CW 45-51
<b>Venue</b>	Blended learning format. Presence sequences take place in Olten
<b>Bibliography</b>	<p><u>Pre-course</u> The scripts for this module will be available on moodle timely before the module starts. Likewise, selected scientific articles and instructions for pre-work are announced on the moodle platform.</p> <p><u>Course material</u> Oura K, Lifshits V.G., Saranin A.A., Zotov A.V., Katayama M. , Surface Science: An Introduction, ISBN 978-3-642-05606-2, Springer Verlag, Berlin Heidelberg, 2010. Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E. Lemons, <i>Biomaterials Science. An Introduction to Materials in Medicine: An Introduction to Materials in Medicine</i>, 2004.</p> <p>Interactive simulations (<a href="https://phet.colorado.edu/en/simulations/category/new">https://phet.colorado.edu/en/simulations/category/new</a>)</p> <p>Selected recent scientific articles</p>
<b>Language</b>	English
<b>Links to other modules</b>	<p>Collaboration with modules C3 “Polymers and Applications” and C1 “Materials Science”.</p> <p>Specialisation modules FHNW: “Bio-interfaces and Bio-conjugate Chemistry”, “Medical Device Development”, “Implant Design and Manufacturing”.</p>
<b>Comments</b>	
<b>Last Update</b>	21.03.2023