

Master in Life Sciences

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

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

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	<ul style="list-style-type: none"> • Profilometry, 3D-SEM, confocal laser scanning microscope • Calometer, tribometer • Dynamic contact angle measurement • Non-destructive testing
Teaching / learning methods	<p>Lecture and blended learning: <u>Contact lessons</u></p> <ul style="list-style-type: none"> • Lectures, Q&A-sessions • Group Exercises • Individual Project Studies • Demonstrations <p><u>Self-study</u></p> <ul style="list-style-type: none"> • Learning videos • interactive simulations (https://phet.colorado.edu/en/simulations/category/new) • Individual Project Studies
Assessment of learning outcome	1. Final written exam, closed book, (100%)
Format	7-weeks
Timing of the module	Autumn semester, CW 45-51
Venue	Blended learning format. Presence sequences take place in Olten
Bibliography	<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 (https://phet.colorado.edu/en/simulations/category/new)</p> <p>Selected recent scientific articles</p>
Language	English
Links to other modules	<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>
Comments	
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