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	**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
Lecturers	• Dr. Michael de Wild, FHNW • M. Theodor Bühler, FHNW • Dr. Patrick Shahgaldian, FHNW
Entry requirements	Scientific background in chemistry, physics and analytical chemistry. The students need a Bachelor in Materials Sciences, Chemistry, Physics, Engineering, Biomedical engineering or equivalent. Basic lectures on materials sciences, chemistry, physics and biomaterials are a prerequisite to follow this course.
Learning outcomes and competences	After completing the module, students will be able to: • explain in-depth modern microscopic and spectroscopic surface and nanomaterials 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 proper 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. • identify artefacts derived from the used methods.

Module contents	• 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
	  ○ Measuring, perimeter, blob analysis, fractal analysis
	  ○ Segmentation, particle counting
	• (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)
	• TOF-SIMS techniques

	• XPS and applications • Porosimetry: gravimetry, MIP, BET, µCT • Profilometry, 3D-SEM, confocal laser scanning microscope • Calometer, tribometer • Dynamic contact angle measurement • Non-destructive testing
Teaching / learning methods	Lecture and blended learning: Contact lessons • Lectures, Q&A-sessions • Group Exercises • Individual Project Studies • Demonstrations Self-study • 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	Olten and/or online
Bibliography	Pre-course 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. Course material 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, *Biomaterials Science. An Introduction to Materials in Medicine: An Introduction to Materials in Medicine,* 2004. Interactive simulations (https://phet.colorado.edu/en/simulations/category/new) Selected recent scientific articles
Language	English
Links to other modules	Collaboration with modules C3 “Polymers and Applications” and C1 “Materials Science”. Specialisation modules FHNW: “Biointerface Engineering”, “Medical Device Development”, “Implant Design and Manufacturing”.
Comments	
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