Module	***Near-Field Optics and Plasmonics***
Code	71422
Instruction language	English
ECTS credits	3
Credit hours	3
Duration	1 semester
Cycle	Each winter semester
Coordinator	Prof. Othmar Marti
Lecturer	Dr. Manuel Rodrigues Gonçalves
Allocation to study programs	Advanced Materials M.Sc., elective module, 3rd Semester Physics M.Sc., elective module, 1st or 2nd Semester
Formal prerequisites	None
Recommended prerequisites	Knowledge of geometrical wave optics, Maxwell's equations and electromagnetism, fundamentals of algebra and mathematical analysis.
Learning objectives	Students who successfully passed this module • understand the mathematical description of electromagnetic waves in near- and far-field • know the physical basis of surface plasmons and the preparation of plasmonic nanostructures • can operate optical scanning near-field microscopes • can simulate optical properties of nanoparticles
Syllabus	• Concepts of near-fields and far-fields • Principles of confocal and SNOM microscopy • SNOM probes and near-fields probing methods • Fresnel formulas • Light scattering, absorption and extinction of isolated nanoparticles • Mie theory • Plasmons in films and nanoparticles • Fabrication techniques of noble metal nanostructures • Simulation of optical properties of plasmonic particles • Surfaces-enhanced Raman scattering • Near-field enhancement and fluorescence • Optical forces and thermal effects of plasmons • Quantum plasmonics Lab experiments: • Fabrication of plasmonic nanostructures • Confocal microscopy: reflection and transmission modes • SNOM in illumination/transmission mode • Angle-resolved spectroscopy • Light scattering and surface-plasmon resonance

	• Surface enhanced Raman scattering
Literature	• Principles of Nano-Optics 2nd Ed., L. Novotny and B. Hecht, Cambridge 2014 • Nanoplasmonics,V. Klimov, Pan Stanford Publishing 2014 • Modern Introduction to Surface Plasmons, D. Sarid and W. Challener, Cambridge 2010 • Journal papers and lectures script
Teaching and learning methods	Lecture with practical course (2 hour per week)
Workload	30 hours lab and exercise (attendance time) 60 hours self-study and examination preparation Total: 90 hours
Assessment	Written examination and lab work.
Examination	11981 Near-Field Optics and Plasmonics (AMS, FSPO 2012) 11516 Surface Plasmon Photonics (PHYS , FSPO 2014)
Grading procedure	The module grade is the examination grade.
Basis for	Research in Nanosciences