Title of module	**VII Molecular Tracing Methods**
Modulecoordinator	**Prof. Dr. Carsten Theiss**

Credit points	5	**Semester(s) in which the module is taught**	2
Contact hours	4	**Workload**	150 hours

Lecturer(s)	Adamietz, Bühler, Happel, Theiss
Type of teaching	Compact course (5 weeks) consisting of: a. Seminar (4×90 minutes) b. Practical course (8×180) c. Compact practical course "Radiation protection & radioactive methods" (1 week, 8h/day) taught in semester holidays Presentations will be given by the students during the seminar; communication skills will be trained during discussions.
Relation to curriculum	Compulsory; For master students of Biology/Biotechnology and Biochemistry of RUB also suitable as elective course.
Recommended prerequisites	Module III “Stem Cell Practical Courses” is recommended
Aims	The module aims to provide students with experience of all relevant microscopic techniques and their application range, including the use of ionizing radiation in medicine and biology, safety and protection regulations in order to perform biochemical tracing methods with radioactive labels. Students will be enabled to handle small amounts of ionizing radiation and to set up experiments with respect to radiation protection.
Learning outcome	Knowledge: Students can recognize and classify modern microscopic techniques and their application in stem cell biology and life sciences in general. Students are aware of chances and limitations of techniques using ionizing radiation in stem cell biology, life sciences and medicine. Skills: Students can record images using the different techniques and analyze the resulting images. Students can apply the different techniques according to their physical basis. Competencies: Students are competent to evaluate the strengths, limitations and drawbacks of the different techniques and critically assess their fields of application in new contexts. Students are able to analyze different types of micrographs, to design experiments with respect to radiation safety and to plan complex experiments involving radiation.
Contents of module	Seminar (4×90 minutes each) and practical course (8×180 minutes each): - Live cell imaging - Stimulated emission depletion microscopy (STED) - Laser scanning microscopy - Electron microscopy Compact course: - Physical basics of ionizing radiation (6 × 45 minutes) - Ionizing radiation: Measuring techniques (3 × 45 minutes)

	- techniques for radiation protection (4 × 45 minutes) - Radiation biophysics (4 × 45 minutes) - Ionizing radiation techniques in life sciences (2×45 minutes) - Ionizing radiation in medicine (2×45 minutes) - Practical course (21 h)
Study and examination requirements; Forms of examination	Students performance during the practical and presentations including discussions with lecturers and fellow students in the seminar are required. Assessment is based on a written exam consisting of 40 questions, of which some are Multiple Choice, others involve calculations, concerning the contents of the compact practical course.
Literature	Confocal Microscopy Methods and Protocols. Stephen W. Paddock (ed.) "Methods in Molecular Biology", v. 123, Humana Press. Electron Microscopy Methods and Protocols M A Nasser Hajibagheri, (ed.), 1999, "Methods in Molecular Biology", v. 117, Humana Press Microscopy and Histology for Molecular Biologists: A Users Guide (2002). J. Kiernan and I. Mason (eds.) Portland Press limited. Theiss C, Meller K (2013). Fluorescence Proteins and Time-Lapse Imaging of the Cytoskeleton. Protocols in Neuroscience, Interdisciplinary Methods for Investigation of the Cytoskeleton. Ed.: R. Dermietzel. Springer Press. Adamietz, Bühler, Happel, Theiss: written abstracts; printed powerpoint slides