Title of module	**III Stem Cell Practical Courses (Wahlpflichtmodul)**
Module coordinator	**Prof. Dr. I. Dietzel-Meyer/Dr. S. Divvela**

Credit points	18	**Semester(s) in which the module is taught**	1
Contact hours	20	**Workload**	540 hours

Lecturer(s)	Behr, Brand-Saberi, Bühler, Divvela, Förster, Gellisch, Günther-Pomorski, Heumann/Neumann, Morosan-Puopolo, Lang, Link, Tenbusch, Theiss, Wiese, Winklhofer, Zähres u.a.
Type of teaching	Two weeks advanced laboratory courses with integrated seminars, guidance and supervision of experimental performance. Supervision of protocols Active participation in seminars, completion of practical tasks and detailed protocols. Feedback regarding understanding the scientific background of the experiments Teamwork. Discussing the feasibility and necessity of using stem cells in biochemistry, biology and medicine
Relation to curriculum	Compulsory; every student has to choose 4 different courses out of a large number offered by different scientific groups of the ISTEM supervisors For master students of Biochemistry of RUB also suitable as elective lecture.
Recommended prerequisites	No prerequisites from curriculum; Students taking this module will be expected to have a basic understanding of cell biology, biochemistry and molecular genetics
Aims	Students will become familiar in theory and practice with specific techniques related to stem cell biology and will gain the competence to apply them as required.
Learning outcome	Knowledge: Students have gained knowledge of different basic techniques related to stem cell research, depending on the host labs visited. Skills: The students have acquired basic skills to perform these techniques. They will learn how to present their experimental data. Competencies: Students should have gained. a) Awareness of the latest scientific findings and literature pertaining to the questions addressed in the host labs. b) Competence to interpret the obtained results. c) Competence to relate a particular method or a spectrum of methods to solving of particular scientific problems in stem cell biology. Representative example I (Brand-Saberi/Morosan-Puopolo) The participants should learn to identify different chicken embryos (HH) stages and to isolate them from the egg. The students will learn how to do small microsurgeries in ovo. The participants should gain knowledge about somitogenesis and myogenesis in chicken embryo. The participants will learn about the advantages of using chicken embryo as an experimental model. The students will learn how to incubate chicken eggs, to identify Hamburger and Hamilton stages and to do small microsurgeries in ovo. Isolation of the embryos from the chicken egg, fixation and embedding for vibratome sections.Vibratome sections will help the students to learn an easy and fast method to gain more information about different

	structures (somite, neural tube and blood vessels). Representative example II (Wiese) After completion of the laboratory course the students will have an insight into the culture of mouse embryonic stem cells in vitro. They have learned differentiation protocols on these cells towards neural progenitor cells. This includes also the analysis of central markers for neural differentiation as well as the quality control for the undifferentiated cells. On the level of methods the students will learn the techniques for Western Blot, RT-PCR, and Immunhistochemistry.
Contents of module	Muscle stem cell biology, Embryoid bodies, Gastruloids, iPSC generation, Investigating the expression pattern of developmental control genes by in situ hybridization, Ionophores as selective inhibitors of tumor stem cells and first approaches to clarify the underlying mechanisms, Cultivation & Characterization of novel multipotent human stem cells, Protein purification and transduction, Investigations on adult hippocampal neurogenesis in transgenic mice Mesenchymal Stem Cells for Regenerative Medicine Epigenetics Changes in Tumor Cells Immunhistochemistry of adult stems cells in the SVZ Lab Rotation - Regenerative Medicine in Plastic Surgery Isolation and culturing of mouse embryonic stem cells Culture and differentiation of neural precursor cells
Study and examination requirements; Forms of examination	Active participation in seminars, completion of practical tasks and detailed protocols are required. The assessment is based on a written laboratory report. Each report should between 10 and 15 pages and contains e.g. Introduction, Methods, Results, Discussion and Literature.
Literature	Essential Current Concepts in Stem Cell Biology, 2020, Brand-Saberi (Editor), Springer Nature "Vertebrate Myogenesis", Beate Brand-Saberi (ed.) Springer-Verlag 2001, Problems and Results in Cell Differentiation “Vertebrate Myogenesis: Stem Cells and Precursors” Beate Brand-Saberi (ed.) Springer-Verlag 2014, Problems and Results in Cell Differentiation Yusuf F. and Brand-Saberi B. (2012). Myogenesis and muscle regeneration. Histochemistry and Cell Biology, 138(2):187-199 Confocal Microscopy Methods and Protocols. Stephen W. Paddock (ed.) "Methods in Molecular Biology", v. 123, Humana Press.