

Module sheet

Title of module	V Tissue Engineering
Module coordinator	Dr. Marion Böing

Credit points	5	Semester in which the module is taught	2
Contact hours	3	Workload	150 hours

Lecturer(s)	Behr, Böing, Giebel, Jacobsen, Klump, Kögler, Köller, Sengstock, Trapp, Zähres
Type of teaching	Lecture (2 hours per week) Seminar (1 hour per week) Discussions in context with lectures and seminar; lecturers ask for feedback regarding understanding and progress; Blackboard Skills for efficient research interactions will be trained during the seminars which will be taught in a compact course organized as a mini-symposium organized by the students themselves.
Relation to curriculum	Compulsory; For master students of Biology/Biotechnology and Biochemistry of RUB also suitable as elective lecture.
Recommended prerequisites	No prerequisites from curriculum
Aims	In the module "Tissue Engineering" the students will obtain an overview of current approaches of tissue reconstruction. Students will become familiar with the macroscopic and microscopic anatomy and function of the main organ systems including their regenerative capacities; they will familiarize with the technical approaches and current limitations for the repair of these organ systems.
Learning outcome	Knowledge: Students have learned the macroscopic and microscopic anatomy and function of organ systems, cell-based therapies and gene therapies for tissue-specific replacement. Skills: Students can apply principles of tissue culture and of "Good manufacturing practice" (GMP), which will be taught theoretically as a general preparation for practical modules. Competencies: Students are capable of developing approaches for solving tissue-specific problems of tissue reconstitution and have the ability to integrate different disciplines to this purpose.
Contents of module	<ul style="list-style-type: none"> • Morphogenesis and Tissue Engineering • Biomaterials in Tissue Engineering • Stem cells for toxicological and pharmacological assays • Gene Transfer and Gene Therapy • Generation of iPS • Tissue Engineering using Adult Stem Cells (HSC/MS/NSC) • Tissue Engineering using Pluripotent Stem Cells (ES/iPS) • Cardiovascular Cell Engineering • Hematopoietic Cell Engineering

	<ul style="list-style-type: none"> • Isolation of mesenchymal stem cells from bone marrow aspirate/adipose tissue • Musculoskeletal Cell Engineering • Neural Cell Engineering • Biological Bionics – regeneration of tissues in situ and in vivo (not a major topic in current schedule) • Clinical Experience, Regulations and Ethics • Molecular Pharming (Protein production in animal and plants) (not a major topic in current schedule) • Seminar 2
Study and examination requirements; Forms of examination	<p>Students performance during discussions and interactions in the context of the lectures and in the seminar with lecturers and fellow students; appreciation of interdisciplinary approaches will be given a high priority. Presentations will be given by the students during the seminar; communication skills will be trained during discussions.</p> <p>The mode of examination will be one multiple choice test at the end of the semester. The examination will be of one hour and the question paper will consist of 30 questions with five choices for each question. The module mark will be based on the exam.</p>
Literature	<p>Lanza; Robert, Langer; Robert and Vacanti, Joseph (2007): Principles of Tissue Engineering. Third Edition, Academic Press</p> <p>Palsson, Bernhard O.; Bhatia, Sangeeta N. (2003): Tissue Engineering. First Edition, Prentice Hall</p> <p>Denecke B, Horsch LD, Radtke S, Fischer JC, Horn PA, Giebel B. (2013) Human endothelial colony-forming cells expanded with an improved protocol are a useful endothelial cell source for scaffold-based tissue engineering. J Tissue Eng Regen Med. Epub</p>