Annex 1:
Module descriptions

Module number	**Module name**	**Module coordinator**
CMCB-RBM B1	Stem Cells, Development and Regeneration	Prof. Michael Brand Michael.Brand@tu-dresden.de
Learning goals	Upon completion of the module, students will be able to explain the fundamental definitions and concepts of the major stem cell systems, be familiar with the theoretical and practical aspects of somatic stem cell biology, and master the basic principles and molecular mechanisms underlying vertebrate development, organogenesis, and regeneration.	
Content	Contents of the module include the fundamental concepts of stem cell biology, developmental biology, and regeneration. These consist of key topics in cell biology such as the cytoskeleton, cell cycle and cell division, topics relevant to developmental biology from fertilization to organogenesis, and general principles of stem cells and the stem cell niche.	
Teaching and learning methods	4 hours per week (SWS) lecture, 2 hours per week (SWS) seminar, 1 hour per week (SWS) tutorial, self-study.	
Prerequisites	Basic knowledge of cell, molecular, and developmental biology at the undergraduate level is required. Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, parts I+II; Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, part I.	
Applicability	The module is a compulsory module in the master's degree program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test. The prerequisite for the examination is a presentation of 6 hours. The examination language is English.	
Credit points and grades	The module is worth 9 credit points. The module grade corresponds to the grade of the examination assessment.	
Frequency of the Module	The module is offered each winter semester.	
Workload	The workload comprises 270 hours in total.	
Module duration	The module runs for the duration of one semester.	

Reading list	Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, Teile III-V; Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, Teile II-VII; Wolpert, L. et al.: Principles of Development, Oxford Univ Press.

Module number	**Module name**	**Module coordinator**
CMCB-RBM B2	Quantitative Biology	Prof. Gerd Kempermann Gerd.Kempermann@tu-dresden.de
Learning goals	Upon completion of the module, students will be able to recognize the limitations of conventional methods for data analysis and will be able to use systems biology approaches and data-based investigations to understand and explore the complexity of biological systems. They understand the differences between classical genetic and quantitative approaches. They also know analytical methods for quantitative biological data suitable for the study and analysis of small as well as large experimental data sets in the field of molecular biology and genetics. Students will have a basic knowledge of applied bioinformatics and will be able to perform statistical analyses of experimental data, evaluate large-scale biological data sets, such as genome-wide measurements and sequencing data, and understand data integration and modeling techniques for systems-level analysis of biological processes. They also understand how data integration works in multi-omics datasets and how genome sequencing and modeling are fundamentally changing biology. They know what personalized medicine is and what its limitations are.	
Content	Contents of the module are the biology of complex systems, basics of applied bioinformatics, of genetic techniques and biomathematical methods and analysis methods for quantitative biological data.	
Teaching and learning methods	Lecture 2 hours per week, practical 2 hour per, self-study.	
Prerequisites	A knowledge of mathematics at the *Abitur* level (university entrance qualification), basic course, and a basic knowledge of cell biology and human biology at the undergraduate level is required. Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, parts I+II.	
Applicability	The module is a compulsory module in the master's degree program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a written paper of 90 minutes duration and a portfolio of 15 hours. The examination language is English in each case.	

Credit points and grades	The module is worth 8 credit points. The module grade is calculated from the weighted average grade of the examined assessments. The exam paper will be double weighted and the portfolio will be single weighted.
Frequency of the Module	The module is offered each winter semester.
Workload	The workload comprises 240 hours in total.
Module duration	The module runs for the duration of one semester.
Reading list	Voit, E.O.: A First course in Systems Biology, Garland Science; Mitchell, M.: Complexity: A Guided Tour, Oxford University Press.

Module number	**Module name**	**Module coordinator**
CMCB-RBM B3	Scientific Working Methods and Conduct	Prof. Ezio Bonifacio Ezio.Bonifacio@tu-dresden.de
Learning goals	Students master methods of scientific work and are able to distinguish and recognize appropriate and inappropriate behavior in scientific research and potential conflicts. Students will be able to prepare and present a scientific paper, locate, read, analyze, and present a scientific publication. They know the structure of a scientific laboratory project. Furthermore, they are able to develop strategies for the preparation and realization of research proposals, are familiar with the individual steps in the proposal writing process and know the most important national and EU funding programs. Students are aware of proper ethical behavior in scientific studies. They can respond and question when fraud or other unethical behavior is discovered.	
Content	Contents of the module are basic scientific working methods as well as the rules of good scientific practice, in particular the planning of laboratory projects, the writing and structuring of laboratory project reports as well as scientific publications and research proposals, the handling of Reading list, the standards of correct citation, the evaluation of information, the correct handling of research data as well as the critical reflection of results.	
Teaching and learning methods	3 SWS seminar, 1 SWS practical, self-study.	
Prerequisites	Basic knowledge of scientific work in cell, molecular, and developmental biology at undergraduate level is required. Reading list: Zeiger, M.: Essentials of Writing Biomedical Research Papers, McGraw-Hill.	
Applicability	The module is a compulsory module in the master's degree program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a complex assessment totaling 20 hours and a non-public oral examination as an individual examination of 25 minutes duration. The examination language is English.	
Credit points and grades	The module is worth 5 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.	
Frequency of the Module	The module is offered each year in the winter semester.	
Workload	The workload comprises 150 hours in total.	
Module duration	The module runs for the duration of two semesters.	

Module number	Module name	Module coordinator
CMCB-RBM B4	Cell and Tissue Analysis and Transgenesis	Prof. Nikolay Ninov Nikolay.Ninov@tu-dresden.de
Learning goals	Students will be familiar with the basic molecular biology techniques used to target and modify the DNA of a eukaryotic cell to an organism, including the principle of CRISPR-Cas9 gene editing and genome engineering technology. They understand the ethical considerations associated with this new technology and its potential applications. Students will be familiar with the major analytical methods used to detect successful genetic modifications, including microscopy and flow cytometry. They have basic knowledge of flow cytometry and its practical applications. Students have an overview of simple and high-end microscopy and know the basics of beam optics, wave optics, fluorescence microscopy, and digital imaging in the life sciences. They know fundamental light-optical principles and are able to examine biological samples using various light-optical methods (transmitted light, fluorescence, confocal microscopy). They also master basic methods of sample preparation for light microscopic analysis.	
Content	Contents of the module are the basic molecular biological methods for the targeted modification of the DNA of a eukaryotic cell to an organism, including the principle of the gene editing and genome engineering technology CRISPR-Cas9, basics and practical applications of microscopy, including transmitted light, fluorescence, confocal microscopy, and flow cytometry as well as the handling of measuring instruments and samples and the evaluation of measurement results.	
Teaching and learning methods	4 SWS lecture (in block), 2 SWS practical (in block), self-study.	
Prerequisites	Basic knowledge of optics as well as cell biology and histology, and transmitted light and fluorescence microscopy at the undergraduate level is required. Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, parts I+II; Murphy, D.B.& Davidson M.W.: Fundamentals of Light Microscopy and Electronic Imaging, Wiley-Blackwell, chapter 1; Tsang, S.H.: Precision Medicine, CRISPR, and Genome Engineering, Springer, chapter I.	
Applicability	The module is a compulsory module in the master's degree program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 50 hours. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade corresponds to the grade of the examined assessment.	

Frequency of the Module	The module is offered each winter semester.
Workload	The workload comprises 180 hours in total.
Module duration	The module runs for the duration of one semester.
Reading list	Murphy, D.B. & Davidson M.W.: Fundamentals of Light Microscopy and Electronic Imaging, Wiley-Blackwell, Kapitel 2-18; Tsang, S.H.: Precision Medicine, CRISPR, and Genome Engineering, Springer, Teile II+III; Lou, Y.: CRISPR Gene Editing, Humana Press; Sadler Edepli K.: Zebrafish at the Interface of Development and Disease Research, Academic Press.

Module number	Module name	Module coordinator
CMCB-RBM W1	Electron Microscopy	Dr. Thomas Kurth Thomas.Kurth@tu-dresden.de
Learning goals	Students know the basics of electron microscopy and its application in the life sciences. They master the basic methods for preparing biological specimens for transmission (TEM) and scanning electron microscopy (scanning electron microscopy: SEM) and for correlative light and electron microscopy (CLEM). This includes the production of semi- and ultra-thin sections as well as immunolabeling. They have knowledge of other preparation and analysis methods such as cryopreparation, cryoelectron microscopy and 3D analysis of biological samples. They have knowledge of basic electron optical principles and are able to examine biological samples using TEM and SEM.	
Content	Contents of the module are the physical basics of electron microscopy, the general and special preparation methods for TEM, SEM and CLEM with application examples, the handling of measuring instruments and samples as well as the evaluation of measurement results.	
Teaching and learning methods	1 SWS lecture (in block), 2 SWS practical (in block), self-study. Participation in the module is limited to nine participants in accordance with § 6 paragraph 7 of the study regulations.	
Prerequisites	Basic knowledge of optics as well as cell biology and histology, and transmitted light and fluorescence microscopy at the undergraduate level is required. Prerequisite Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, parts I+II.	
Applicability	In the master's degree program Regenerative Biology and Medicine, the module is one of three elective modules of the laboratory practical elective area, one of which must be chosen.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 25 hours. The examination language is English.	
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each winter semester.	
Workload	The workload comprises 150 hours in total.	
Module duration	The module runs for the duration of one semester.	
Reading list	Bozzola, J.J. & Russell L.D.: Electron Microscopy, Jones and Bartlett.	

Module number	**Module name**	**Module coordinator**
CMCB-RBM W2	Cell Separation, Isolation and Analysis	Prof. Karsten Kretschmer Karsten.Kretschmer@tu-dresden.de
Learning goals	Students will have knowledge of the basic concepts of cell sorting and analysis, particularly using flow cytometric techniques. They are familiar with the possible applications of density gradient centrifugation, antibody-based separation techniques such as magnetically activated cell sorting (MACS) and fluorescence activated cell sorting (FACS) in biological problems and can plan and perform appropriate experiments. They are familiar with instrumentation, setup and quality control, measurement and data analysis, and are also proficient in basic sample preparation methods for FACS/ MACS analysis.	
Content	Contents of the module are the basic concepts and application possibilities of different cell sorting and cell analysis methods such as MACS and FACS, the handling of measuring instruments and samples as well as the evaluation of measurement results.	
Teaching and learning methods	1 SWS lecture (in block), 2 SWS practical (in block), self-study. Participation in the module is limited to twenty participants in accordance with § 6 paragraph 7 of the study regulations.	
Prerequisites	Basic knowledge of cell, molecular, and developmental biology at the undergraduate level and basic knowledge of flow cytometry are required, preparatory Reading list: Givan, A.L.: Flow Cytometry: First Principles, Wiley-Liss.	
Applicability	In the master's degree program Regenerative Biology and Medicine, the module is one of three elective modules of the laboratory practical elective area, one of which must be chosen.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 25 hours. The examination language is English.	
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each winter semester.	
Workload	The workload comprises 150 hours in total.	
Module duration	The module runs for the duration of one semester.	
Reading list	Shapiro, H.M. Practical Flow Cytometry, Wiley-Liss.	

Module number	**Module name**	**Module coordinator**
CMCB-RBM W3	Techniques to Modify Gene Expression	Jun.-Prof. Franziska Knopf Franziska.Knopf@tu-dresden.de
Learning goals	Students will use zebrafish (Danio rerio) embryos to master micromanipulation techniques to modify gene expression or the genome. They are capable of producing transient overexpression of proteins at early developmental stages by injection of mRNA. Furthermore, students have basic knowledge of how genetically modified animals are generated by injecting DNA. They can explain the method of injection into the bloodstream of embryos as well as perform the analysis of embryonic or larval phenotypes using light or fluorescence microscopy.	
Content	Contents of the module are the basics and possible applications of micromanipulation procedures for the modification of gene expression or the genome in the zebrafish embryo, as well as handling of injections and evaluation of results by means of light or fluorescence microscopy, age of the animals used: younger than 120 hours after fertilization.	
Teaching and learning methods	1 SWS lecture (in block), 2 SWS practical (in block), self-study. Participation in the module is limited to ten participants in accordance with § 6 paragraph 7 of the study regulations.	
Prerequisites	Basic knowledge of cell, molecular, and developmental biology at the undergraduate level is required. Prerequisite Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, parts I+II; Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, part I.	
Applicability	In the master's degree program Regenerative Biology and Medicine, the module is one of three elective modules of the laboratory practical elective area, one of which must be chosen.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 25 hours. The examination language is English.	
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each winter semester.	
Workload	The workload comprises 150 hours in total.	
Module duration	The module runs for the duration of one semester.	

Reading list	Westerfield, M.: The Zebrafish Book, Eugene, University of Oregon Press.

Module number	**Module name**	**Module coordinator**
CMCB-RBM B5	Advanced Methods and Human Cell Technologies	Prof. Mike Karl mike_o.karl@tu-dresden.de
Learning goals	Students master the fundamental methods of human cell engineering. They have knowledge of pluripotent stem cell generation, direct conversion of somatic cell types, and the use of human stem cells to create 2D cell models and 3D organ-like tissue models, called organoids, in cell culture. Students are familiar with modern sequencing technologies. They understand the application of next generation sequencing (NGS) for transcriptome and epigenome analyses of cells and tissues. Students are familiar with principles of tissue engineering and understand the basic principles to adapt the chemical and mechanical properties of biomaterials to the requirements of medical applications.	
Content	Contents of the module are the basic principles and possible applications of human cell technology. Topics include, in particular, induced pluripotent stem cells, including reprogramming of somatic cells, 3D cell culture and tissue models, so-called organoids as well as NGS, biotechnological processes in regenerative medicine, tissue engineering and biomaterials.	
Teaching and learning methods	Lecture 2 hours per week, Seminars 2 hours per week, self-study.	
Prerequisites	Basic knowledge of cell, molecular, and developmental biology at the undergraduate level is required. Prerequisite Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, Teile I+II; Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, part I.	
Applicability	The module is a compulsory module in the master's degree program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test. The examination language is English.	
Credit points and grades	The module is worth 7 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each year in the summer semester.	
Workload	The workload comprises 210 hours in total.	
Module duration	The module runs for the duration of one semester.	

Reading list	Lanza, R. et al.: Principles of Tissue Engineering, Academic Press; Davies, J. & Lawrence, M.: Organoids and Mini-Organs, Academic Press; Munshi, A.: DNA-Sequencing - Methods and Applications, Intech Open; Ainscough, J. et al.: Nuclear Reprogramming and Stem Cells, Humana Press; Armstrong, L.: Epigenetics, Garland Science.

Module number	**Module name**	**Module coordinator**
CMCB-RBM B6	Clinical Translation and Trials in Practice	Prof. Martin Bornhäuser Martin.Bornhäuser@uniklinikum-dresden.de
Learning goals	Students master the basics of regulatory requirements for clinical research on humans in the EU and Germany and have an overview of the German Medicines Act and Good Clinical Practice (GCP), the international quality standard for clinical trials. They are familiar with EU regulations for advanced cellular therapies and local regulations for cell-based therapies, Good Manufacturing Practice (GMP) specifications, and genetic manipulation of cells in clinical trials. Students know the basics of planning and conducting phase I-III studies based on an experimental therapy and have an overview of the required infrastructure, preclinical data, and bioinformatics methods needed to plan a researcher-initiated study. They also know the Declaration of Helsinki and principles of patient law. They are familiar with the required documents for clinical protocols, such as investigator information, patient education, and informed consent. Students have a fundamental understanding of the regulatory requirements and preclinical studies including toxicological testing, metabolism, and pharmacology that must be met before a clinical trial can be initiated. They are also familiar with the duties and obligations of a sponsor and a researcher according to the requirements of the GCP.	
Content	Contents of the module are the basics of translational medicine. This includes regulatory and ethical requirements for the practical conduct of clinical trials, project management, planning and evaluation, biometric modeling, and initial insights into the bench-to-bedside translation process.	
Teaching and learning methods	Lecture 2 hours per week, self-study.	
Prerequisites	A basic knowledge of pathophysiology and human disease patterns, as well as undergraduate level biometric analysis and statistics, is required. Prerequisite Reading list: Friedmann, L.M. et al.: Fundamentals of Clinical Trials, Springer, chapter 1.	
Applicability	The module is a compulsory module in the master's degree program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test. The examination language is English.	
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the	The module is offered each winter semester.	

Module	
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.
Reading list	Friedmann, L.M. et al.: Fundamentals of Clinical Trials, Springer, chapter 2; Pocock, S.J.: Clinical Trials - A practical Approach, Wiley.

Module number	**Module name**	**Module coordinator**
CMCB-RBM B7	Aging and Senescence	Dr. Maximina Yun Maximina.Yun@tu-dresden.de
Learning goals	Students are familiar with the essential biological processes of senescence and aging and their influence on the regeneration of cells and tissues. They know about molecular mechanisms in senescence and aging and understand the relationship between immunosenescence and inflammaging as well as age-associated processes under physiological and pathological conditions.	
Content	Contents of the module include the mechanisms underlying biological aging, particularly the relationship between cellular senescence and age-related pathologies, the importance of cellular senescence in the maintenance of tissue homeostasis and immune system function, and the role during regeneration.	
Teaching and learning methods	Lecture 1 hour per week, Seminars 1 hour per week, self-study.	
Prerequisites	Basic knowledge of cell, molecular, and developmental biology at the undergraduate level is required. Prerequisite Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, parts I+II; Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, part I.	
Applicability	The module is a compulsory module in the master's degree program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test. The examination language is English.	
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each winter semester.	
Workload	The workload comprises 150 hours in total.	
Module duration	The module runs for the duration of one semester.	
Reading list	Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, Teile III-V; Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, parts II-VII; Wolpert,.: & Hayflick, L.: Cellular Aging and Replicative Senescence, Springer.	

Module number	**Module name**	**Module coordinator**
CMCB-RBM R1	Cell, Organ and Model Organism Based Research	Prof. Federico Calegari Federico.Calegari@tu-dresden.de
Learning goals	Students possess extensive theoretical knowledge in working with cell systems such as pluripotent and somatic stem cells, organ systems such as hematopoietic cells, pancreas, central nervous system, and heart, and at least one of the key model organisms. Students demonstrate the ability to set up and conduct experiments to test hypotheses in the field of regenerative therapies. They have extensive practical experience in experimental work with model organisms. Students are able to reflect on the knowledge gained in practice and place it in a scientific context.	
Content	Contents of the module are basic cell biological methods in theory and practice, selected current research topics, application possibilities of state-of-the-art technologies for scientific questions, documentation and critical analysis of obtained experimental data, time and resource management in an own scientific project, literature research, written and oral presentation and discussion of projects.	
Teaching and learning methods	Lecture 2 hours per week, tutorial 2 hours per week, practical 20 hours per week, self-study.	
Prerequisites	Basic knowledge of stem cell biology, biochemistry, physics, concepts of cell and molecular biology, anatomy and biology at the undergraduate level is required. Reading list: Janssen, K.: Emerging Model Organisms I, CSHL Press; Alberts, B. et al.: Biology of the Cell, Garland Science, parts I+II; Wolpert, L. et al.: Principles of Development, Oxford University Press; Urry, L.A. et al.: Campbell – Biology, Pearson.	
Applicability	The module is a compulsory module in the master's degree program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 59 hours. The examination language is English.	
Credit points and grades	The module is worth 14 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each semester.	
Workload	The workload comprises 420 hours in total.	
Module duration	The module runs for the duration of one semester.	

Reading list	Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, parts III-V; Nüsslein-Volhard, C. & Dahm, R.: Zebrafish: A Practical Approach, Oxford University Press; Hedrich H.J.: The Laboratory Mouse, Academic Press; Janssen, K.: Emerging Model Organisms II, CSHL Press.

Module number	**Module name**	**Module coordinator**
CMCB-RBM R2	Molecular Biology Research	Prof. Gerd Kempermann Gerd.Kempermann@tu-dresden.de
Learning goals	Students possess extensive theoretical knowledge, particularly in stem and tissue cell research, including current knowledge of molecular biology techniques. Students are able to set up and perform experiments designed to prepare reagents and analyze stem cells and tissues to test hypotheses in the field of molecular biology. They have extensive hands-on experience in experimental work in regenerative molecular biology. Students are able to reflect on the knowledge gained in practice and place it in a scientific context.	
Content	Contents of the module are basic molecular biological methods in theory and practice, selected current research topics, application possibilities of state-of-the-art technologies for scientific questions, documentation and critical analysis of obtained experimental data, time and resource management in an own scientific project, literature research, written and oral presentation and discussion of projects.	
Teaching and learning methods	Lecture 2 hours per week, tutorial 2 hours per week, practical 20 hours per week, self-study.	
Prerequisites	Participants require bachelor's degree-level of molecular biology Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, parts I+II; Griffiths, A.J.F. et al.: Introduction to Genetic Analysis, Freemann Press, part I.	
Applicability	The module is a compulsory module in the master's degree program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 59 hours. The examination language is English.	
Credit points and grades	The module is worth 14 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each semester.	
Workload	The workload comprises 420 hours in total.	
Module duration	The module runs for the duration of one semester.	
Reading list	Alberts, B. et al.: Molecular Biology of the Cell, Garland Science, parts III-V.	

Module number	**Module name**	**Module coordinator**
CMCB-RBM T1a	Developmental and Regenerative Biology: Model Organisms	Dr. Tatiana Sandoval-Guzmán tatiana.sandoval_guzman@tu-dresden.de
Learning goals	Students master the basic molecular and cellular mechanisms of tissue and organ development and regeneration. They are able to explain biochemical relationships and signaling systems of organogenesis and regeneration. They are familiar with the major invertebrate models of organogenesis, particularly Planaria, Drosophila, and vertebrate models, as well as zebrafish and axolotl, and regeneration in comparison with animal models for translational research.	
Content	Contents of the module are the fundamental cellular and molecular mechanisms underlying the development and regeneration of tissues and organs as well as the most important model organisms of regenerative and translational research.	
Teaching and learning methods	Lecture 4 hours per week, self-study.	
Prerequisites	Basic knowledge of cell, molecular, and developmental biology at the undergraduate level is required. Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science; Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, part I.	
Applicability	The module is a compulsory module of the topic Developmental and Regenerative Cell Biology in the master program Regenerative Biology and Medicine. It provides prerequisites for the Developmental and Regenerative Biology module: Concepts and Methods.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each year in the summer semester.	
Workload	The workload comprises 180 hours in total.	
Module duration	The module runs for the duration of one semester.	
Reading list	Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, parts II-VII; Atala, A. et al.: Principles of Regenerative Medicine, Academic Press; Wolpert, L. et al.: Principles of Development, Oxford University Press.	

Module number	**Module name**	**Module coordinator**
CMCB-RBM T1b	Developmental and Regenerative Biology: Concepts and Methods	Dr. Tatiana Sandoval-Guzmán tatiana.sandoval_guzman@tu-dresden.de
Learning goals	Students are familiar with embryonic and adult stem cells in the various relevant model organisms and are able to apply their advanced knowledge and understand the therapeutic potential of stem cells. Students know the possible applications of live cell and intravital microscopy as well as quantitative fluorescence techniques in biological problems and are able to plan corresponding experiments. They have an overview of current genomic methods and understand the theoretical basis and principles of state-of-the-art genomic tools.	
Content	Contents of the module include development, tissue differentiation and regeneration of fins, tails, limbs, and selected organs, basic concepts and applications of live cell and intravital microscopy, and quantitative fluorescence techniques.	
Teaching and learning methods	Lecture 4 hours per week, Seminars 1 hour per week, self-study.	
Prerequisites	Basic knowledge of cell, molecular, and developmental biology at the undergraduate level is required, as well as the knowledge acquired in the Developmental and Regenerative Biology module: Model organisms competencies required. Reading list: Alberts, B. et al.: Molecular Biology of the Cell, Garland Science; Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, part I; Papakovsky, D.: Live Cell Imaging, Humana Press, Kapitel I; Diaspro, A.: Optical Fluorescence Microscopy - From the Spectral to the Nano Dimension, Springer, chapter I.	
Applicability	The module is a compulsory module of the topic Developmental and Regenerative Cell Biology in the master program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each [winter] semester.	
Workload	The workload comprises 180 hours in total.	
Module duration	The module runs for the duration of one semester.	

Reading list	Barresi, M.J.F. & Gilbert, S.F.: Developmental Biology, Sinauer Associates, parts II-VII; Atala, A. et al.: Principles of Regenerative Medicine, Academic Press; Wolpert, L. et al.: Principles of Development, Oxford University Press; Papakovsky, D.: Live Cell Imaging, Humana Press, part II; Diaspro, A.: Optical Fluorescence Microscopy - From the Spectral to the Nano Dimension, Springer, chapters 2-14; Pawley, J.B.: Handbook of Biological Confocal Microscopy, Springer.

Module number	**Module name**	**Module coordinator**
CMCB-RBM T2a	Principles of Neuroscience	Prof. Gerd Kempermann Gerd.Kempermann@tu-dresden.de
Learning goals	Students possess elementary knowledge of cellular, molecular, and systemic neurobiology, neuropharmacology, behavioral science, and sensory physiology. They know the anatomical and functional basics of the nervous system, the complex networks that arise in neurobiology, and the stimulus reception and processing of various sensory organs. Students possess knowledge of brain structure, development, and function, as well as its cellular and molecular elements and physiology.	
Content	Contents of the module are the basic principles of neurobiology. This includes key topics such as neuroanatomy, neuropharmacology, behavioral science, and sensory physiology.	
Teaching and learning methods	Lecture 4 hours per week, self-study.	
Prerequisites	Basic knowledge of developmental biology and biochemistry as well as cell and molecular biology at the undergraduate level is required. Reading list: Bear, M.F. et al.: Neuroscience - Exploring the Brain, Wolters Kluwer, chapter 1.	
Applicability	The module is a compulsory module of the subject area Regenerative Neuroscience in the master's program Regenerative Biology and Medicine. It creates the prerequisite for taking the module Neurobiology and Regeneration.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute examination. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each year in the summer semester.	
Workload	The workload comprises 180 hours in total.	
Module duration	The module lasts one semester.	
Reading list	Bear, M.F. et al.: Neuroscience - Exploring the Brain, Wolters Kluwer, parts II-IV; Kandel E.R. et al.: Principles in Neural Science, McGraw-Hill.	

Module number	**Module name**	**Module coordinator**
CMCB-RBM T2b	Neurobiology and Regeneration	Prof. Catherina Becker Catherina.Becker@tu-dresden.de
Learning goals	Students master the fundamentals of neuroanatomy, neuropathology, neuroimmunology, and neuroregeneration. They have an overview of fundamental experimental neurobiological methods including electrophysiology. Students are familiar with clinically relevant mechanisms used to understand pathophysiologies and their therapies, and are familiar with the clinical concepts of diseases for which neuroregenerative therapies exist or are being developed.	
Content	Contents of the module are the basic principles of neuroregeneration and experimental neurobiological methods. This includes key topics such as neuroanatomy, neuropathology, neuroimmunology, and electrophysiology.	
Teaching and learning methods	Lecture 4 hours per week, Seminars 1 hour per week, self-study.	
Prerequisites	Basic knowledge of developmental biology, biochemistry, and cellular and molecular biology at the undergraduate level is required, as well as the skills to be acquired in the Principles of Neuroscience module. Reading list: Bear, M.F. et al.: Neuroscience - Exploring the Brain, Wolters Kluwer, chapter 1.	
Applicability	The module is a compulsory module of the subject area Regenerative Neuroscience in the master's program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute examination. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each winter semester.	
Workload	The workload comprises 180 hours in total.	
Module duration	The module lasts one semester.	
Reading list	Bear, M.F. et al.: Neuroscience - Exploring the Brain, Wolters Kluwer, parts II-IV; Kandel E.R. et al.: Principles in Neural Science, McGraw-Hill.	

Module number	Module name	Module coordinator
CMCB-RBM T3a	Hematologic, Immunological and Vascular Systems and Disease	Prof. Karsten Kretschmer Karsten.Kretschmer@tu-dresden.de
Learning goals	Students understand the structure and function of organ systems affected in disease, including their development, morphology, and physiology. They have basic theoretical knowledge of the pathology of diseases and advanced knowledge of the use of cell and tissue regeneration to correct these pathologies and are familiar with the clinical concepts of diseases for which regenerative medicine has therapeutic utility, particularly in the areas of hematopoiesis, oncology, autoimmunity, bone biology, and angiology.	
Content	Contents of the module include the fundamental concepts of hematology, immunology, bone biology, and angiology. Key topics include hematopoiesis, oncogenesis, innate and acquired immune defenses, the development of autoimmune, bone, and vascular diseases, and potential regenerative therapies.	
Teaching and learning methods	Lecture 4 hours per week, self-study.	
Prerequisites	Basic knowledge of stem cell biology, biochemistry and physics, and cell and molecular biology at the undergraduate level is required. Reading list: Hoffman, R. et al.: Hematology - Basic Principles and Practice, Elsevier, chapter 9; Murphy, K. & Weaver, C.: Janeway`s Immunobiology, Garland Science, chapter 1; Ribatti D., Inflammation and Angiogenesis, Springer, chapter 1; Bilezikian, J. et al., Principles of Bone Biology, Academic Press, volume 1, part 1, chapters 1-3.	
Applicability	The module is a compulsory module of the subject area Regenerative and Medicine in the master's program Regenerative Biology and Medicine. It provides the prerequisites for the Peripheral Organ Systems and Disease module.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each year in the summer semester.	
Workload	The workload comprises 180 hours in total.	
Module duration	The module runs for the duration of one semester.	

Reading list	Bunting, K.D. & Qu, CK.: Hematopoietic Stem Cell Protocols, Humana Press; Kondo, M.: Hematopoietic Stem Cell Biology, Humana Press; Murphy, K. & Weaver, C.: Janeway`s Immunobiology, Garland Science; Ribatti D., Inflammation and Angiogenesis, Springer; Bilezikian, J. et al., Principles of Bone Biology, Academic Press.

Module number	**Module name**	**Module coordinator**
CMCB-RBM T3b	Peripheral Organ Systems and Disease	Prof. Ezio Bonifacio Ezio.Bonifacio@tu-dresden.de
Learning goals	Students are familiar with the pathophysiology of diseases, clinical presentations, and current standards of care, and are familiar with current problems and concepts of regenerative approaches, translational aspects, and strategies and tools of regenerative medicine. Students are familiar with the bench-to-bedside translation process.	
Content	Contents of the module include the clinical concepts of diseases for which regenerative medicine has therapeutic utility, particularly in the areas of hepatology, diabetes, neuroregenerative medicine, retinal degeneration, and cardiovascular diseases. Key topics include the planning and conduct of appropriate clinical trials and the interplay of the immune system with the various organ systems.	
Teaching and learning methods	Lecture 4 hours per week, Seminars 1 hour per week, self-study.	
Prerequisites	Basic knowledge of stem cell biology, biochemistry and physics, and cell and molecular biology at the undergraduate level is required, as well as the skills to be acquired in the Hematologic, Immunological and Vascular Systems and Disease module. Reading list: Janeway`s Immunobiology, Garland Science, chapters 15 and 16, Friedmann, L.M. et al.: Fundamentals of Clinical Trials, Springer, chapter 1.	
Applicability	The module is a compulsory module of the subject area Regenerative and Medicine in the master's program Regenerative Biology and Medicine.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade corresponds to the grade of the examined assessment.	
Frequency of the Module	The module is offered each [winter] semester.	
Workload	The workload comprises 180 hours in total.	
Module duration	The module runs for the duration of one semester.	
Reading list	Hammer, G et al, Pathophysiology of disease, Mc Graw Hill; Atala, A. et al.: Principles of Regenerative Medicine, Academic Press; Holt, R.I.G. et	

	l., Textbook of Diabetes, Wiley-Blackwell; Friedmann, L.M. et al.: Fundamentals of Clinical Trials, Springer.