Annex 1: module description – master's program Physics of Life

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL1	Introductory Biological Physics	Prof. Dr. Helmut Schießel helmut.schießel@tu-dresden.de
Learning goals	Upon completion of the module, students have a basic understanding of the concepts, formalism and methodology of modern statistical physics and the theory of dynamical systems. They are able to independently apply the knowledge they have acquired to simple problems at the interface of physics and biology and understand the analogies between mathematical and biological formulations. The students can write simple computer programs for the numerical treatment of dynamical systems.	
Content	The module includes mathematical concepts of statistical physics, important physical statistical models, basic biophysical theories at the molecular level, non-linear dynamical systems, order parameters, minimal models and polymer models. It also includes the statistical physics of phase transitions and scaling concepts.	
Teaching and learning methods	4 hours per week (SWS) lecture, 2 SWS exercise, self-study	
Prerequisites	Mathematical knowledge, in particular integral and differential calculus, as well as physical knowledge, in particular thermodynamics and statistical physics, are required at bachelor level. Students can prepare for the module with the current editions of the following literature: Huang, Introduction to Statistical Physics, CRC Press, London and New York.; Philip Nelson, Biological Physics, Chiliagon Science, Hudon; Edwards & Doi, Polymer Physics Clarendon Press, Oxford, and Strogatz, Nonlinear Dynamics and Chaos, Perseus Books, Massachusetts.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life. It creates the prerequisites for the modules Advanced Biological Physics, Pattern Formation and Active Matter Hydrodynamics, Research Lab Project, Applied Biophysics, Advanced Biophysics, Computational Biophysics, Advanced Theoretical Biophysics, Applied Nanotechnology und Advanced Nanotechnology.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written examination in the case that more than 20 students are registered. If less than 20 students are registered it comprises an oral examination of 20 minutes as a non-public individual examination. The number of	

	registered students will be published at the end of the registration period. The prerequisite for the examination is a set of exercises of a total duration of 10 hours. The examination language is English.
Credit points and grades	The module is worth 8 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the winter semester.
Workload	The workload comprises 240 hours in total.
Module duration	The module runs for the duration of one semester.
Other person involved	Prof. Dr. Benjamin Friedrich benjamin.m.friedrich@tu-dresden.de

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL2	Physical Chemistry and Experimental Methods	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	After completion of the module, the students know the experimental biophysical methods in the field of molecular and cellular biophysics including their theoretical background and have gained practical experience. They are able to choose specific experimental biophysical methods and have gained basic knowledge of their applications. The students know the basics of thermodynamics, transport phenomena, classical reactions and enzyme kinetics, phase transition, biomechanics and electrophysiology and can apply the acquired knowledge. They can describe biological phenomena in a quantitative and mathematical way on the basis of physical and chemical concepts.	
Content	The module comprises methods of the structure determination, microscopy and spectroscopy as well as of modern biophysical methods. It also covers the basics of thermodynamics, mixture of materials, phase separation, chemical reaction kinetics, enzyme, molecular transport, molecular interactions, electrochemistry and electrophysiology.	
Teaching and learning methods	4 hours per week (SWS) lecture, 2 SWS seminar, 1 SWS exercise, 1 SWS practical, self-study.	
Prerequisites	Knowledge of mathematics, especially differential and integral calculus, basic knowledge of differential equation as well as of physics, especially mechanics, electrodynamics, thermodynamics at the *Abitur* level (university entrance qualification). Reading list as a preparation for the module: Courant & Hilbert: Methods of Mathematical Physics, Wiley, Berlin; Jackson: Classical Electrodynamics, Wiley, New York; Sakurai & Napolitano: Modern Quantum Mechanics, Cambridge University Press, US; Huang: Introduction to Statistical Physics, CRC Press, London and New York.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life. In the course of study Biological Physics, it provides prerequisites for the module Research Lab Project, Applied Biophysics, Advanced Biophysics, Computational Biophysics, Advanced Theoretical Biophysics, Applied Nanotechnology and Advanced Nanotechnology.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a complex assessment totalling 10 hours and a 90-minute written examination. The examination language is English.	
Credit points and grades	The module is worth 10 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.	
Module frequency	The module is offered each year in the winter semester.	

Workload	The workload comprises 300 hours in total.
Module duration	The module runs for the duration of one semester.
Other person(s) involved	PD Dr. Elisabeth Fischer-Friedrich elisabeth.fischer-friedrich@tu-dresden.de

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL3	Statistical Principles and Experimental Design	Prof. Dr. Dr. M.D. Ingo Röder ingo.roeder@tu-dresden.de
Learning goals	After completing the module, students master the methodological and practical basics of statistical data analysis and modeling as well as the design of experiments. They are able to describe and analyze data with statistical methods and to interpret their results correctly. Furthermore, they acquire the ability to plan experiments in such a way that subsequent data evaluation is meaningful and efficient in the context of the respective research question.	
Content	The module includes a comprehensive overview of fundamentals of probability theory (e.g. random variables, distributions, limit theorems), statistical inference (e.g. point and interval estimation within a frequentist, Bayesian or likelihood-based framework), principle and application of statistical tests (e.g. significance and goodness of fit tests), concepts and applications of statistical models (e.g. linear and generalized linear models), principles of experimental design (e.g. replication, randomization, blocking and sample size estimation) and special designs (e.g. factorial designs, block designs).	
Teaching and learning methods	2 hours per week (SWS) lecture, 2 SWS seminar, self-study.	
Prerequisites	Basic knowledge of probability, analysis of functions of one or more variables, linear algebra, vector and matrix calculus, and a basic knowledge of computer programming at the undergraduate level is required. Reading list as a preparation for the module: Rohatgi & Saleh: An Introduction to Probability and Statistics, Wiley, Berlin; Hefferon: Lineare Algebra, http://joshua.smcvt.edu/linearalgebra/, Colchester, Vermont, USA; Tamás Rudas: Handbook of Probability: Theory and Applications, Sage Publications, Inc., Budapest.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life. In the course of study Biological Physics, it provides prerequisites for the module Research Lab Project. It is also a compulsory module in the course of study Nanoscience and Nanotechnology, specialization Nanoelectronics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a 90-minute written examination. The prerequisite for the examination is a set of exercises of a total duration of 10 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.	
Module frequency	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 one semester.

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL4	Molecular Biology and Biochemistry of Cells and Tissues	Prof. Dr. Simon Alberti simon.alberti@tu-dresden.de
Learning goals	Students will know basic principles of biochemistry and molecular cell biology. This includes a basic understanding of the composition, structure, function and synthesis of biomolecules, the genome, proteome, and lipidome, protein complexes and membranes. In addition, students have a fundamental knowledge of enzymology, metabolism, gene expression, and cellular organization. Students understand important concepts and principles of cell biology and mechanobiology, such as intracellular organization and compartmentalization, mechanisms of cellular signaling and communication, and cell-cell interactions in tissue formation.	
Content	The module includes fundamentals of modern biochemistry and molecular cell biology with topics such as in particular DNA, chromosomes and genomes, protein composition, structure and folding, as well as protein-protein interactions, lipids and membranes. Additional content includes molecular cell biology with topics such as cell cycle and programmed cell death, signal transduction and cell-cell communication, intracellular compartmentation, cytoskeleton, tissue dynamics, and collective behavior of molecules and active systems, among others.	
Teaching and learning methods	6 hours per week (SWS) lecture, 2 SWS practical, 4 SWS seminar, self-study	
Prerequisites	Knowledge of physics at the undergraduate level is required as well as knowledge of biology and chemistry at the *Abitur* level (university entrance qualification). Reading list as a preparation for the module: John Tymoczko et al.: Biochemistry, W.H. Freeman and Company, New York; Bruce Alberts et al.: Molecular biology of the Cell, Norton & Company, USA.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics. It provides prerequisites for the module Research Lab Project.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of two 90-minute written examinations and two complex assessments of a total duration of 30 hours each. The examination language is English.	
Credit points and grades	The module is worth 14 credit points. The module grade is calculated from the weighted average grade of the examined assessments. The written examinations are weighted twice, the complex assessments once.	
Module frequency	The module is offered each year, starting in the winter semester.	
Workload	The workload comprises 420 hours in total.	

Module duration	The module runs for the duration of two semesters.
Other persons involved	Dr. Rita Mateus: rita.drumond_mateus@tu-dresden.de Dr. Natalie Dye: natalie_anne.dye@tu-dresden.de Dr. Adele Doyle: adele.doyle@mailbox.tu-dresden.de

Module number	Module name	Module coordinator
CMCB-Ma-PoL5	Elements of Nanobiotechnology	Prof. Dr. Gianaurelio Cuniberti g.cuniberti@tu-dresden.de
Learning goals	Students have a basic knowledge of nanobiotechnology. They are able to recognize the relevance of complex natural nanostructures for technical applications and have an understanding of how nanotechnology methods can be used in biology. They are able to independently develop and discuss presentations. The students thus possess scientific communication skills. They also know new development potentials of molecular bioengineering by handling cellular machines for biological and biotechnological applications. Students will be able to link previously acquired knowledge in molecular cell biology and biochemistry. They are familiar with in-depth concepts of functional biomolecular units, with the specific aim of using them as nanoscale functional elements in more complex technological or medical processes.	
Content	The module includes biomimetic cluster synthesis, nanocrystals for biological detection, new principles of biomolecular electronics, manipulation of nanoparticles in three dimensions, and current issues in the context of nanotechnology and bionanotechnology. In addition, the module includes topics such as the structure and function of lipid membranes as well as associated membrane proteins, molecular processes of energy conversion, interaction and folding of protein structures, structure and function of DNA as well as associated proteins, molecular mechanisms of signal transduction and protein degradation, classification and functioning of viruses, and cell motility.	
Teaching and learning methods	4 hours per week (SWS) lecture, 2 SWS seminar, 1 SWS practical, self-study	
Prerequisites	Knowledge of biology and chemistry at the *Abitur* level (university entrance qualification) and knowledge of molecular biology, biochemistry and physics at the undergraduate level is required. Reading list as a preparation for the module: W. Pompe, G. Rödel, H.-J. Weiss, M. Mertig: Bio-Nanomaterials: Designing Materials Inspired by Nature, Wiley-VCH, Berlin; G.L. Hornyak et al.: Introduction to nanoscience and nanotechnology, CRC Press, Boca Raton; N.T. Nguyen, S.T. Wereley: Fundamentals and applications of microfluidics, Artech House, Boston and London; F. Leal-Calderon, V. Schmitt, J. Bibette: Emulsion science. Basic principles, Springer, New York; Thomas D. Pollard, William C. Earnshaw, Jennifer Lippincott-Schwartz: Cell Biology, Elsevier, Edinburgh.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics. It provides prerequisites for the module Research Lab Project and Advanced Nanotechnology.	

Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a non-public oral examination as an individual examination of 20 minutes duration and a complex assessment totalling 10 hours. The examination language is English.
Credit points and grades	The module is worth 7 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.
Module frequency	The module is offered each year, starting in the winter semester.
Workload	The workload comprises 210 hours in total.
Module duration	The module runs for the duration of two semesters.
Other person involved	PD Dr. Stefan Diez stefan.diez@tu-dresden.de

Module number	Module name	Module coordinator
CMCB-Ma-PoL6	Advanced Biological Physics	Prof. Dr. Benjamin Friedrich benjamin.m.friedrich@tu-dresden.de
Learning goals	Upon completion of the module, students have in-depth knowledge of theoretical biological physics and are familiar with important model concepts, methods for mathematical modeling of biological systems, in particular time-dependent random processes, and concepts of continuum mechanics. They can develop simple computer programs for numerical simulation of these models. The students think interdisciplinary and can apply the acquired theoretical knowledge to independently develop mathematical models to describe selected biological processes.	
Content	The module includes important model concepts of theoretical biological physics, for example polymerization dynamics of biopolymers, force generation by molecular motors, cell and tissue mechanics. It also includes concepts of continuum mechanics and their application to the description of selected biological systems. Further contents are advanced statistical models, time-dependent random processes, linear and generalized linear models, stochastic differential equations including numerical methods for their solution, Fokker-Planck equation and applications to biophysical problems.	
Teaching and learning methods	4 hours per week (SWS) lecture, 4 SWS exercise, self-study	
Prerequisites	Knowledge of mathematics such as integral and differential calculus, ordinary and partial differential equations, basic knowledge of statistical physics, and basic knowledge of simple polymer models at the undergraduate level. In addition, the qualification acquired in the module Introductory Biological Physics is required. Reading list as a preparation for the module: Philip Nelson: Biological Physics; Chiliagon Science, Hudon; Jonathon Howard: Mechanics of Motor Proteins and the Cytoskeleton, Sinauer Associates Inc, Oxford University Press; WCK Poon and David Andelman: Soft Condensed Matter Physics in Molecular and Cell Biology, CRC Press, Boca Raton; Chaikin & Lubensky: Condensed Matter Physics, Cambridge Univerity Press; Cambridge; Landau & Lifshitz: Hydrodynamics, Pergamon Press, Oxford; Happel & Brenner: Low-Reynolds Number Hydrodynamics, Springer, Dordrecht; Groot & Mazur: Non-Equilibrium Thermodynamics, Courier Corporation, Dover Publications Inc, New York.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a complex assessment totalling 20 hours and, for more than 20 registered students a 90-minute written	

	examination; for up to 20 registered students a non-public oral examination as an individual examination of 30 minutes duration. The number of registered students will be published at the end of the registration period. The examination language is English.
Credit points and grades	The module is worth 10 credit points. The module grade is calculated from the weighted average grade of the examined assessments. The written examination is weighted twice, the complex assessment once.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 300 hours in total.
Module duration	The module runs for the duration of one semester.
Other person involved	PD Dr. Helmut Schießel helmut.schiessel@tu-dresden.de

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL7	Pattern Formation and Active Matter Hydrodynamics	Prof. Dr. Stephan Grill stephan.grill@tu-dresden.de
Learning goals	The students possess in-depth knowledge of theoretical biological physics. They know concepts and methods for the mathematical description of spatiotemporal dynamics as well as important model concepts of active biological matter. Students have an in-depth understanding of models of self-organized pattern formation, especially with regard to structure formation in biological systems at the cell and tissue level. Students will be able to use the acquired theoretical knowledge to independently develop mathematical models to describe selected biological processes.	
Content	The module includes hydrodynamics of active matter, and self-organized pattern formation. Furthermore, it includes concepts of non-equilibrium physics and their application to the description of selected biological systems, including order parameters, generalized thermodynamic forces and currents, Onsager relations, entropy production, dynamics of active fluids. The module includes liquid crystal theory, active gel theory, and reaction-diffusion dynamics and Turing models.	
Teaching and learning methods	4 hours per week (SWS) lecture, 2 SWS exercise, self-study	
Prerequisites	Knowledge of mathematics such as integral and differential calculus, ordinary and partial differential equations, basic knowledge of statistical physics, and knowledge of continuum mechanics at the undergraduate level is required. In addition, the qualification acquired in the module Introductory Biological Physics is also assumed. Reading list as a preparation for the module: Courant & Hilbert: Philip Nelson: Biological Physics; Chiliagon Science, Hudon; Jonathon Howard: Mechanics of Motor Proteins and the Cytoskeleton, Sinauer Associates Inc, Oxford University Press; WCK Poon and David Andelman: Soft Condensed Matter Physics in Molecular and Cell Biology, CRC Press, Boca Raton; Chaikin & Lubensky: Condensed Matter Physics, Cambridge Univerity Press; Cambridge; Groot & Mazur: Non-Equilibrium Thermodynamics, Courier Corporation, Dover Publications Inc, New York.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a complex assessment totalling 20 hours and, for more than 20 registered students a 90-minute written examination; for up to 20 registered students a non-public oral examination as an individual examination of 30 minutes duration. The number of registered students will be published at the end of the registration period. The prerequisite for the examination is a set of	

	exercises of a total duration of 10 hours. The examination language is English.
Credit points and grades	The module is worth 10 credit points. The module grade is calculated from the weighted average grade of the examined assessments. The written examination is weighted twice, the complex assessment once.
Module frequency	The module is offered each year in the winter semester.
Workload	The workload comprises 300 hours in total.
Module duration	The module runs for the duration of one semester.
Other person involved	Prof. Dr. Otger Campas: otger.campas@tu-dresden.de

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL8	Research Lab Project	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	Upon completion of the module, students are able to work scientifically and independently on a project and they can implement and apply important methods, technologies and laboratory routines, they are able to interpret and describe results and to present them to the research group.	
Content	The module consists of well-defined, relevant and state-of-the-art research topics in the field of experimental or theoretical biophysics or nanobiotechnology, according to the specialization chosen by the students and new research findings in those areas. The student can choose a research lab specialized in the field of either experimental or theoretical biophysics or nanobiotechnology.	
Teaching and learning methods	14 hours per week (SWS) practical, self-study	
Prerequisites	The qualifications obtained in the module Introductory Biological Physics, Physical Chemistry and Experimental Methods, Statistical Principles and Experimental Design, Molecular Biology and Biochemistry of Cells and Tissues as well as Elements of Nanobiotechnology are required.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination as an individual examination of 30 minutes duration as well as a non-graded complex assessment totalling 10 hours. The examination language is English.	
Credit points and grades	The module is worth 14 credit points. The module grade is calculated from the unweighted average grade of the examined assessments, taking into account §15 par. 1 sentences 5 and 6 of the Examination Regulations. If the complex assessment is passed, the module grade corresponds to the grade of the oral examination.	
Module frequency	The module is offered each year in the winter semester.	
Workload	The workload comprises 420 hours in total.	
Module duration	The module runs for the duration of one semester.	

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL9	Applied Biophysics	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	Upon completion of the module, students know about chosen topics of the state-of-the-art/current research in the field of applied experimental biological physics. The students have in-depth knowledge in chosen research area. They are able to work and orientate themselves within the different scientific areas covered by experimental biological physics.	
Content	The module consists of selected research topics in the field of applied experimental biological physics based on current research. In-depth-topics in bioinformatics, applied microscopy techniques and image analysis, protein engineering and networks as well as applied cell biology can be chosen.	
Teaching and learning methods	At the student's option, the module consists of lecture, seminar, tutorial and exercise of 4 hours per week (SWS) in total as well as self-study. 4 SWS courses have to be chosen from the catalogue Physics of Life. The catalogue will be published including the required examinations at the beginning of the semester as is customary at the Center for Molecular and Cellular Bioengineering. A minimum of 4 SWS has to be completed.	
Prerequisites	The qualifications acquired in the module Introductory Biological Physics and Physical Chemistry and Experimental Methods are required.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics, in the specialization Experimental Biological Physics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination as an individual examination of 20 minutes duration as well as a complex assessment totalling 10 hours. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.	
Module frequency	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.	

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL10	Advanced Biophysics	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	Upon completion of the module, students know about chosen topics of the state-of-the-art/current research in the field of applied experimental biological physics. The students have in-depth knowledge in chosen research area. They are able to work and orientate themselves within the different scientific areas covered by experimental biological physics.	
Content	The module consists of selected research topics in the field of applied experimental biological physics based on current research. In-depth-topics in bioinformatics, applied microscopy techniques and image analysis, protein engineering and networks as well as applied cell biology can be chosen.	
Teaching and learning methods	At the student's option, the module consists of lecture, seminar, tutorial and exercise of 4 hours per week (SWS) in total as well as self-study. 4 SWS courses have to be chosen from the catalogue Physics of Life. The catalogue will be published including the required examinations at the beginning of the semester as is customary at the Center for Molecular and Cellular Bioengineering. A minimum of 4 SWS has to be completed.	
Prerequisites	The qualifications acquired in the module Introductory Biological Physics and Physical Chemistry and Experimental Methods are required.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics, in the specialization Experimental Biological Physics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination as an individual examination of 20 minutes duration as well as a complex assessment totalling 10 hours. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.	
Module frequency	The module is offered each year in the winter semester.	
Workload	The workload comprises 180 hours in total.	
Module duration	The module runs for the duration of one semester.	

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL11	Computational Biophysics	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	Upon completion of the module, students know about chosen topics of the state-of-the-art/current research in the field of computational theoretical biophysics. The students have in-depth knowledge in chosen research area. They are able to work and orientate themselves within the different scientific areas covered by theoretical biological physics.	
Content	The module consists of selected research topics in the field of computational theoretical Biophysics based on current research. In-depth-topics in bioinformatics, mathematical and structural biology, computational physics and biology as well as network dynamics can be chosen.	
Teaching and learning methods	At the student's option, the module consists of lecture, seminar, tutorial and exercise of 4 hours per week (SWS) in total as well as self-study. 4 SWS courses have to be chosen from the catalogue Physics of Life. The catalogue will be published including the required examinations at the beginning of the semester as is customary at the Center for Molecular and Cellular Bioengineering. A minimum of 4 SWS has to be completed.	
Prerequisites	The qualifications acquired in the module Introductory Biological Physics and Physical Chemistry and Experimental Methods are required.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics, in the specialization Theoretical Biological Physics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination as an individual examination of 20 minutes duration as well as a complex assessment totalling 10 hours. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.	
Module frequency	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.	

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL12	Advanced Theoretical Biophysics	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	Upon completion of the module, students know about chosen topics of the state-of-the-art/current research in the field of computational theoretical Biophysics. The students have in-depth knowledge in the chosen research area. They are able to work and orientate themselves within the different scientific areas covered by theoretical biological physics.	
Content	The module consists of selected research topics in the field of computational theoretical Biophysics based on current research. In-depth topics in bioinformatics, mathematical and structural biology, computational physics and biology as well as network dynamics can be chosen.	
Teaching and learning methods	At the student's option, the module consists of lecture, seminar, tutorial and exercise of 4 hours per week (SWS) in total as well as self-study. 4 SWS courses have to be chosen from the catalogue Physics of Life. The catalogue will be published including the required examinations at the beginning of the semester as is customary at the Center for Molecular and Cellular Bioengineering. A minimum of 4 SWS has to be completed.	
Prerequisites	The qualifications acquired in the module Introductory Biological Physics and Physical Chemistry and Experimental Methods are required.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics, in the specialization Theoretical Biological Physics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination as an individual examination of 20 minutes duration as well as a complex assessment totalling 10 hours. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.	
Module frequency	The module is offered each year in the winter semester.	
Workload	The workload comprises 180 hours in total.	
Module duration	The module runs for the duration of one semester.	

Module number	**Module name**	**Module coordinator**
CMCB-Ma-PoL13	Applied Nanotechnology	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	Upon completion of the module, students know about chosen topics of the state-of-the-art/current research in the field of applied nanotechnology. The students have in-depth knowledge in chosen research area. They are able to work and orientate themselves within the different scientific areas covered by nanobiotechnology.	
Content	The module consists of selected research topics in the field of applied nanobiotechnology based on current research. In-depth topics in nanotechnology, nanooptics, molecular modelling, nanoelectronics and materials science can be chosen.	
Teaching and learning methods	At the student's option, the module consists of lecture, seminar, tutorial and exercise of 4 hours per week (SWS) in total as well as self-study. 4 SWS courses have to be chosen from the catalogue Physics of Life. The catalogue will be published including the required examinations at the beginning of the semester as is customary at the Center for Molecular and Cellular Bioengineering. A minimum of 4 SWS has to be completed.	
Prerequisites	The qualifications acquired in the module Introductory Biological Physics and Physical Chemistry and Experimental Methods are required.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics, in the specialization Nanobiotechnology.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination as an individual examination of 20 minutes duration as well as a complex assessment totalling 10 hours. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.	
Module frequency	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.	

Module number	Module name	Module coordinator
CMCB-Ma-PoL14	Advanced Nanotechnology	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	Upon completion of the module, students know about chosen topics of the state-of-the-art/current research in the field of applied nanotechnology. The students have in-depth knowledge in chosen research area. They are able to work and orientate themselves within the different scientific areas covered by nanobiotechnology.	
Content	The module consists of selected research topics in the field of applied nanobiotechnology based on current research. In-depth topics in nanotechnology, nanooptics, molecular modelling, nanoelectronics and materials science can be chosen.	
Teaching and learning methods	At the student's option, the module consists of lecture, seminar, tutorial and exercise of 4 hours per week (SWS) in total as well as self-study. 4 SWS courses have to be chosen from the catalogue Physics of Life. The catalogue will be published including the required examinations at the beginning of the semester as is customary at the Center for Molecular and Cellular Bioengineering. A minimum of 4 SWS has to be completed.	
Prerequisites	The qualifications acquired in the module Introductory Biological Physics and Physical Chemistry and Experimental Methods are required.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Biological Physics, in the specialization Nanobiotechnology.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination as an individual examination of 20 minutes duration as well as a complex assessment totalling 10 hours. The examination language is English.	
Credit points and grades	The module is worth 6 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.	
Module frequency	The module is offered each year in the winter semester.	
Workload	The workload comprises 180 hours in total.	
Module duration	The module runs for the duration of one semester.	

Module number	**Module name**	**Module coordinator**
CMCB-Ma-E1	Lab Rotation	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	Upon completion of the module, students are able to work scientifically and independently on a project and they can implement and apply important methods, technologies and laboratory routines, they are able to interpret and describe results and to present them to the research group.	
Content	The module consists of well-defined, relevant and state-of-the-art research topics in the field of experimental or theoretical biophysics or nanobiotechnology, according to the specialization chosen by the students and new research findings in those areas. The student can choose a research lab specialized in the field of either experimental or theoretical biophysics or nanobiotechnology.	
Teaching and learning methods	8 hours per week (SWS) practical, self-study	
Prerequisites	Knowledge in mathematics and physics at the undergraduate level is required.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Nanoscience and Nanotechnology, specialization Biophysics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination as an individual examination of 30 minutes duration as well as a complex assessment totalling 10 hours. The examination language is English.	
Credit points and grades	The module is worth 8 credit points. The module grade is calculated from the unweighted average grade of the examined assessments, taking into account §15 par. 1 sentences 5 and 6 of the Examination Regulations. If the complex assessment is passed, the module grade corresponds to the grade of the oral examination.	
Module frequency	The module is offered each year in the winter semester.	
Workload	The workload comprises 240 hours in total.	
Module duration	The module runs for the duration of one semester.	

Module number	Module name	Module coordinator
CMCB-Ma-E2	Extended Biophysics	Prof. Dr. Michael Schlierf michael.schlierf@tu-dresden.de
Learning goals	Upon completion of the module, students know about chosen topics of the state-of-the-art/current research in the field of experimental and theoretical biophysics. The students have in-depth knowledge in chosen research areas. They are able to work and orientate themselves in the field of experimental and theoretical biophysics.	
Content	The module consists of selected research topics in the field of experimental and theoretical biophysics based on current research. In-depth topics in theoretical biophysics, bioinformatics, mathematical and structural biology, computational physics and biology as well as network dynamics, microscopy techniques and image analysis, applied cell biology and protein engineering can be chosen.	
Teaching and learning methods	At the student's option, the module consists of lecture, seminar, tutorial and exercise of 12 hours per week (SWS) in total as well as self-study. 12 SWS courses have to be chosen from the catalogue Physics of Life. The catalogue will be published including the required examinations at the beginning of the semester as is customary at the Center for Molecular and Cellular Bioengineering.	
Prerequisites	Knowledge in mathematics and physics at the undergraduate level is required.	
Applicability	The module is a compulsory module in the master's degree program Physics of Life, in the course of study Nanoscience and Nanotechnology, in the specialization Biophysics.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination as an individual examination of 20 minutes duration as well as a complex assessment totalling 10 hours and. The examination language is English.	
Credit points and grades	The module is worth 12 credit points. The module grade is calculated from the unweighted average grade of the examined assessments.	
Module frequency	The module is offered each year in the winter semester.	
Workload	The workload comprises 360 hours in total.	
Module duration	The module runs for the duration of one semester.	