TUD Dresden University of Technology
Faculty of Computer Science
Faculty of Mathematics
Center for Molecular and Cellular Bioengineering

Study Regulations for the consecutive Master's degree program Computational Modeling and Simulation

as of #date of issue (format: Month DD, YYYY)#

Pursuant to § 14 para. 4 sentence 1 in conjunction with § 2 para. 2 and § 37 para. 1 of the Saxon Higher Education Act of May 31, 2023 (SächsGVBl. p.329), last amended by Article 2 of the Act of January 31, 2024 (SächsGVBl. p. 83), the Faculty Board of the Faculty of Computer Science, the Faculty Board of the Faculty of Mathematics, and the Scientific Council of the Center for Molecular and Cellular Bioengineering, after consulting the Study Commission for the Master’s program in Computational Modeling and Simulation, have adopted the following statutes, which have been approved by the University Executive Board:

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§ 1
Scope of application

These Study Regulations govern the objectives, content, structure, and organization of the Master's degree program in Computational Modeling and Simulation at TUD Dresden University of Technology on the basis of the Saxon Higher Education Act, the General Examination Regulations, and the Specific Examination Regulations for the consecutive Master's degree program in Computational Modeling and Simulation.

§ 2
Objectives of the degree program

(1) This degree program equips students with the ability to model complex natural or technical systems and to predict or optimize system behavior using computer simulations. They will master the methodological and theoretical foundations of computer-aided modeling and numerical computer simulation. In addition, they will be able to critically reflect on their knowledge within a societal context and conduct technically sound discussions. Building on these skills, they will be able to model and simulate specific systems depending on the track they choose. In the Computational Mathematics track, students will be able to analyze complex, nonlinear mathematical models and partial differential equations in particular, and simulate them using computer-aided methods. In the Visual Computing track, they will become proficient in the modeling and simulation of image and video data, as well as the analysis of human-computer system interactions, including the design of virtual realities. In the Computational Engineering track, they can model and simulate complex technical systems consisting of mechanical and electrical components and analyze how they interact. In the Computational Life Science track, students will be able to model and simulate biological and medical systems such as cells, tissues, and organs, and to investigate their behavior under various conditions. In the Computational Modeling in Energy Economics track, students will learn the fundamentals of modeling energy networks and energy market systems, and will be able to analyze and optimize them with regard to economic and technical issues. In the Applied Artificial Intelligence track, students will be able to model and simulate intelligent systems consisting of hardware and software and to design their interactions. In the Computational Environmental Science and Engineering track, students will be able to model complex ecosystems, analyze ecological interactions, and develop sustainable solutions to environmental problems.

(2) Thanks to their broad expertise in data modeling, computer simulation, and the development and software-implementation of relevant algorithms, graduates are able to analyze and tackle complex problems within the broader societal context. They will acquire scientific methodological skills as well as the ability to identify problems and transfer knowledge, enabling them to take on a wide range of tasks after appropriate training. They will be qualified to work as data engineers, data analysts, simulation engineers, software developers, quants, market researchers, computer-aided engineers, modelers, or managers. Thanks to the project management skills they acquire during their studies, they will also be prepared for an academic career, including doctoral studies.

§ 3
Admission requirements

(1) To be admitted to the degree program, candidates must have completed a first recognized vocational university degree acquired in Germany or a qualification from an officially recognized vocational academy in Computer Science, Mathematics, Science, Business Administration and Economics or Engineering.

(2) In addition, a special aptitude is required. Proof of this particular aptitude is provided by an assessment in accordance with the Aptitude Assessment Regulations for Computational Modeling and Simulation.

(3) Furthermore, knowledge of English at B2 level of the Common European Framework of Reference for Language is a prerequisite. Proof thereof is a relevant examination certificate or language certificate. This may be, in particular, a university entrance qualification that demonstrates the required language proficiency level, or a language proficiency certificate, such as the IELTS (with a score of at least 6.0), or the TOEFL IBT (with a score of at least 79).

§ 4
Start of the degree program

The program can be started each winter semester.

§ 5
Teaching and learning methods

(1) The curriculum is structured in modules. In the individual modules, the course content is taught, consolidated and deepened through lectures, practicals, internships, projects, seminars, tutorials, excursions, language courses and independent study. The scope of teaching forms is usually specified in hours per week (SWS). In modules that are subject to more than one study regulation, synonyms are permitted for Teaching and learning methods with the same content.

(2) The individual teaching and learning forms according to para. 1 sentence 2 are defined as follows:

1. Lectures introduce the subject matter of the modules,
2. Practicals allow students to apply the subject matter in exemplary sub-areas,
3. Internships serve to apply and consolidate the subject matter taught and to acquire practical skills in potential areas of employment,
4. Projects support students in connecting theory to practice and explore specific topics through an interdisciplinary lens. They enable students to develop content for comprehensive, interconnected assignments both individually and in groups; and they foster self-organization and teamwork skills,
5. Seminars enable students to independently research a selected topic under supervision, using academic literature or other materials, to present their findings, discuss them in a group, and write about them,
6. Tutorials support students, especially those at the beginning of their studies, in acquiring knowledge and developing interdisciplinary skills,
7. Excursions take students, under academic supervision, to sites of learning located outside the university, where they can explore relevant topics in greater depth,
8. Language courses convey and train language knowledge, skills and abilities in the respective foreign language, they develop communicative and intercultural skills in an academic and professional context as well as in everyday situations and
9. Independent study enables students to independently acquire both fundamental and in-depth subject-specific knowledge using various media, for instance, teaching resources, literature and the internet in individual work or in small groups.

§ 6
Structure and organization of the degree program

(1) The program is organized into modules. The curriculum is divided into 3 semesters. The third semester is particularly suitable for a temporary stay at another university (mobility window). The fourth semester is dedicated to the preparation of the Master's thesis including the colloquium. Part-time study is possible in accordance with the regulations on part-time study.

(2) The program comprises 2 compulsory modules, 1 elective compulsory module in basic language training, 3 elective compulsory modules in basic subject-specific training, 1 elective compulsory module in basic training in scientific methodology, as well as 1 track in accordance with the choice of the students, which enables them to choose their concentration. Students can choose between the tracks Artificial Intelligence; Computational Engineering; Computational Environmental Science and Engineering; Computational Life Science; Computational Mathematics; Computational Modeling in Energy Economics; and Visual Computing The tracks comprise 1 to 6 compulsory modules and 3 to 8 elective compulsory modules. The choice of elective compulsory modules and track is binding. Elective compulsory modules can be re-selected; the student must submit a written request to the Examination Office stating the module to be replaced and the newly selected elective compulsory module. A track can be re-selected only once; the student must submit a written request to the Examination Office stating the track to be replaced and the newly selected track.

(3) Learning goals, content, Teaching and learning methods included, requirements, applicability including any restrictions on combining modules, frequency, workload, and duration of the individual modules are all listed in the module descriptions in Annex 1 of these Study Regulations.

(4) In deviation from § 2 para. 1 of the Specific Examination Regulations for the consecutive Master's degree program in Computational Modeling and Simulation, selected courses will be held in German in accordance with module descriptions. If, according to the module description, a module primarily serves to acquire foreign language qualifications, classes may also be held in the respective foreign language.

(5) The appropriate allocation of the modules to the individual semester, the observance of which makes it possible to complete the program within the standard period of study, as well as the type and scope of the respective courses included, and the number and standard time of the required study achievements and examined assessments are defined in the study schedule for full-time studies, attached in Annex 2 of these Study Regulations, and in an individual study schedule for part-time studies approved by the Faculty of Computer Science, the Faculty of Mathematics, and the Scientific Council of the Center for Molecular and Cellular Bioengineering.

(6) Upon proposal of the Academic Affairs Committee, the Faculty Board of the Faculty of Computer Science, the Faculty Board of the Faculty of Mathematics, and the Scientific Council of the Center for Molecular and Cellular Bioengineeing may change the selection of elective compulsory modules as well as the study schedule for full-time studies. The current selection of elective compulsory modules will be announced in the usual manner at the beginning of the semester. The amended study schedule for the full-time program shall apply to all students who have been informed about this in the usual manner at the beginning of their studies. The Examination Committee shall decide on any exceptions to sentence 3 upon application by the student.

(7) If participation in an elective compulsory module is limited by the number of available places in accordance with the module description, the selection of participants shall be made in accordance with the module description lots. To this end, students must register for the appropriate elective compulsory module. The form and deadline for registering will be announced to the students in the usual manner. At the end of the registration period, the students will be notified in the usual

manner whether they have been selected for the respective elective compulsory module. If the student was selected, the corresponding elective compulsory module is considered to have been selected pursuant to para. 2 sentence 4.

§ 7
Content of the degree program

(1) The Master's degree program in Computational Modeling and Simulation is research-oriented.

(2) The program includes language training, the fundamentals of good scientific practice, methodological foundations of research projects, additional non-technical skills, as well as the analysis and reflection on research approaches in selected fields. It also covers the fundamentals of mathematics, computer science, and the natural sciences, with a particular focus on computer-aided modeling and simulation. These include, in particular, the fundamentals of mathematics and computer science, machine learning, data analysis, parallel programming, high-performance computing, numerical methods, probability and statistics, computer graphics and visualization, stochastics, the planning and evaluation of computer experiments, as well as knowledge of literature research and the practical application of scientific methods.

(3) The Computational Mathematics track includes numerical analysis, solving partial differential equations with finite element method, scientific computing, computational methods of mathematical biology, mathematical modeling, optimization methods, numerical statistics, and Monte Carlo methods. The Visual Computing track covers topics such as data visualization, algorithms for direct and inverse problems, user interface design, computer graphics, computer vision, image processing, information visualization, interactive media, multimedia, virtual reality, as well as advanced machine learning and artificial intelligence. The Computational Engineering track covers numerical fluid mechanics, the simulation of multibody dynamics, computational methods for multiphysics problems, finite element methods in mechanics, and the computer-aided design and optimization of engineering systems. Topics in the Computational Life Science track include computer modeling of biochemical processes, applied bioinformatics, the simulation of biological systems and processes, statistical methods, the design of experiments, the validation and verification of simulation results, as well as topics in mathematical biology, computer-aided biophysics, scientific visualization in biology and medicine, the simulation of reaction networks, and computer models in cognitive neuroscience. The Computational Modeling in Energy Economics track covers the simulation of electricity markets and macroeconomic energy market systems, the modeling of environmental resources and environmental protection regulations, as well as scientific computing and the numerical solution of partial differential equations. The Applied Artificial Intelligence track covers the modeling and simulation of robotic systems that include both hardware and software components. The Computational Environmental Science and Engineering track covers the modeling and simulation of ecosystems.

§ 8
Credit points

(1) Credit points are awarded in accordance with the European Credit Transfer System. They document the average workload of the students and their individual study progress. One credit point corresponds to a 30-hour workload. Normally, 60 credit points are awarded per academic year, i.e. 30 credit points per semester. The total workload for the degree program corresponds to 120 credit points and comprises the Teaching and learning methods according to type and scope

stipulated in the module descriptions, the study achievements and examined assessments, the master's thesis thesis and the colloquium.

(2) The module descriptions indicate the number of credits that can be earned by each module. Credits are awarded upon passing the module examination. § 6 of the Specific Examination Regulations for the consecutive Master's degree program in Computational Modeling and Simulation shall remain unaffected.

§ 9
Academic advisory and counseling service

(1) General advice will be provided by the Central Student Information and Counseling Service at TU Dresden. It covers questions regarding study options, enrollment modalities and general student affairs. Academic advising throughout the degree program is provided through a mentoring system run by the organizational units involved in the degree program. To this end, at the beginning of their studies, each student is assigned a faculty member involved in the degree program to serve as a mentor.

(2) At the beginning of the third semester, each student who has not yet provided proof of academic performance shall make use of the subject-specific advisory services.

§ 10
Amendments to module descriptions

(1) In order to adapt them to changed conditions, module descriptions may be amended in a simplified procedure in order to optimize study organization, with the exemption of the fields Module name, Learning goals, Content, Teaching and learning methods, Requirements for earning credit points, Credit points and grades and Module duration.

(2) Under the simplified procedure, the Faculty Board of the Faculty of Computer Science, the Faculty Board of the Faculty of Mathematics, and the Academic Council of the Center for Molecular and Cellular Bioengineering shall approve the amendment to the module description upon the recommendation of the Academic Affairs Committee. The amendments must be published in the usual manner.

§ 11
Transitional provisions

(1) These Study Regulations will apply for the first time to students newly enrolled in the Master's degree program in Computational Modeling and Simulation in the 2026/2027 winter semester.

(2) For students who were enrolled in the Computational Modeling and Simulation master's program prior to the 2026/2027 winter semester, unless otherwise provided in paragraph 3, the version of the Study Regulations for the consecutive master's program in Computational Modeling and Simulation dated April 20, 2018 (Official Announcements of TU Dresden No. 9/2018 dated May 5, 2018, p. 2), as last amended by the statute of #Month# #Day#, 2026 (Official Announcements of TU Dresden No. #/2026 dated #Month# #Day#, 2026, p. ##), shall continue to apply through September 30, 2027. Thereafter, these Study Regulations shall also apply to students in accordance with sentence 1. In addition, for non-identical modules, including grades, the module examinations

already taken will be transferred ex officio as a priority, and individual examination performances will also be transferred on the basis of equivalence tables, which are determined by the Examination Committee and announced in the usual manner. With the exception of § 21 para. 5 of the General Examination Regulations, module examinations and examination performances that have not been graded with at least “sufficient” (4.0) or “pass” shall not be transferred. The module grade is generally not recalculated based on exclusively transferred examined assessments. Exceptions are listed in the equivalence tables. For identical modules, all credits shall be carried over ex officio.

(3) Notwithstanding para 2, sentence 2, students referred to in para 2, sentence 1, who have passed all module examinations covered by the Master's examination up to and including September 30, 2027, may continue to apply the version of the Study Regulations applicable to them up to that point, as referred to in para 2, sentence 1, even after September 30, 2027, up to and including September 30, 2028.

§ 12
Entry into force

These Study Regulations enter into force on April 1, 2026.

The foregoing statutes are hereby executed. They shall be published in the official announcements of TU Dresden.

Dresden, as of #date of issue (format: Month DD, YYYY)#

The Rector
of TUD Dresden University of Technology

Prof. Ursula M. Staudinger

Appendix 1
(Regarding Section 6, Paragraph 3)
Module Descriptions

Please note that changes may occur. These are published at the link https://tu-dresden.de/ing/informatik/studium/studienangebot/master-studiengaenge/computational-modeling-and-simulation/regulations

Module name	Soft Skills
Module Number	CMS-SOF
Module coordinator	Prof. Dr. Ivo Sbalzarini ivo.sbalzarini@tu-dresden.de
Learning goals	Students will master scientific research methods and understand the rules of good scientific practice. They will be familiar with the DFG guidelines on good scientific practice and how these are implemented at TUD Dresden University of Technology. They will be able to communicate in English on specialized topics and independently write scientific papers.
Content	The module covers training in good scientific practice, research ethics, and research methodology; the DFG rules on good scientific practice; Laplace's theory of knowledge; literature review; presentation techniques; and writing skills.
Teaching and Learning Formats	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	No prior knowledge is required.
Applicability	This module is a required module in the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a comprehensive assignment totaling 20 hours. The exam is conducted in English.
Credits and Grades	Students can earn 2 credit points for this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 60 hours.
Duration of the module	The module lasts 1 semester.

Module name	Research Assignment
Module number	CMS-PRO
Module coordinator	Prof. Dr. Martin Weigert martin.weigert@tu-dresden.de
Learning goals	Students will master the practical application and implementation of these concepts in an independent research project. They will be able to identify a problem and break it down into work steps that they can tackle independently. They can communicate independently about the project and have mastered the scientific methods of computer modeling—in particular, the design, implementation, and validation of models and simulations—and can apply these to complex application problems.
Contents	The module focuses on a computer-aided modeling or simulation project.
Teaching and learning methods	The module comprises projects totaling 12 SWS and self-study. The language of instruction for the projects is English.
Prerequisites	No prior knowledge is required.
Applicability	This module is a required module in the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a comprehensive assignment totaling 240 hours. The exam language is English .
Credits and Grades	A total of 15 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 450 hours.
Duration of the module	The module spans 1 semester.

Module name	Foreign Language A1 Advanced Level - Arabic
Module number	CMS-LN-A1-1A
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students demonstrate basic proficiency in Arabic at Level A1 of the Common European Framework of Reference for Languages. Students can comprehend slow and clearly articulated concrete information on familiar everyday topics; read and understand short texts that are simple in terms of syntax, semantics, vocabulary, and morphology, focusing on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The content of the Arabic module includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of simple grammatical structures and an appropriate vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Chinese
Module number	CMS-LN-A1-1C
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic proficiency in Chinese at the A1 level of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The content of the Chinese module includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of simple grammatical structures and appropriate vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - German as a Foreign Language
Module number	CMS-LN-A1-1D
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students demonstrate basic proficiency in German at Level A1 of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The module's content in German consists of very simple texts and audio recordings related to everyday situations—particularly in a university setting—basic oral and written text production and interaction on these topics, the development of relevant reading and listening strategies, the mastery of simple grammatical structures and an appropriate vocabulary, as well as exercises to build fluency through various learning formats and using different media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Finnish
Module number	CMS-LN-A1-1FI
Module coordinator	Ute Meyer ute.meyer@tu-dresden.de
Learning goals	Students will acquire basic proficiency in Finnish at Level A1 of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Contents	The content of the Finnish module includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of simple grammatical structures and an appropriate vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - French
Module number	CMS-LN-A1-1FR
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic proficiency in French at Level A1 of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The content of the French module includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of simple grammatical structures and appropriate vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Italian
Module number	CMS-LN-A1-1I
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic proficiency in Italian at the A1 level of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The content of the Italian module includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of simple grammatical structures and an appropriate vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Japanese
Module Number	CMS-LN-A1-1J
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic Japanese language proficiency at Level A1 of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The content of the Japanese module includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of simple grammatical structures and appropriate vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	Students can earn 5 credit points for this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Polish
Module number	CMS-LN-A1-1PL
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic proficiency in Polish at the A1 level of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The module's content in Polish consists of very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of simple grammatical structures and appropriate vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Portuguese
Module number	CMS-LN-A1-1PG
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic proficiency in Portuguese at the A1 level of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The content of the Portuguese module includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of simple grammatical structures and appropriate vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Russian
Module Number	CMS-LN-A1-1RU
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic proficiency in Russian at Level A1 of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The content of the Russian module includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of simple grammatical structures and appropriate vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Swedish
Module number	CMS-LN-A1-1SW
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic proficiency in Swedish at Level A1 of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The module's content in Swedish includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of simple grammatical structures and an appropriate vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Spanish
Module number	CMS-LN-A1-1SP
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students have a basic command of Spanish at Level A1 of the Common European Framework of Reference for Languages. Students can comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts by focusing on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The content of the Spanish module includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of simple grammatical structures and appropriate vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A1 Advanced Level - Czech
Module number	CMS-LN-A1-1T
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic proficiency in Czech at the A1 level of the Common European Framework of Reference for Languages. Students will be able to comprehend slow, clearly articulated, concrete information on familiar everyday topics; read and understand short, syntactically, semantically, lexically, and morphologically simple texts with a focus on key words; deduce the meanings of unfamiliar concrete terms from context; and express themselves using simple phrases about their surroundings and respond appropriately to simple questions about them.
Content	The module's content in Czech includes very simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of simple grammatical structures and an appropriate vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 - Arabic
Module number	CMS-LN-A2-A
Module coordinator	Ute Meyer ute.meyer@tu-dresden.de
Learning goals	Students will acquire basic communicative competence in Arabic at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend slow and clearly articulated concrete information on everyday topics and understand short texts of simple syntax, semantics, vocabulary, and morphology related to everyday and professional experiences when reading, provided the vocabulary is limited to frequently used and internationally understandable words. They can describe their surroundings orally and in writing using simple phrases and sentences, and can largely follow and respond appropriately to short, simple conversations and very simple presentations when the topic is familiar to them.
Contents	The module's content in Arabic consists of simple texts on everyday situations and specific topics—particularly in a university setting—as well as simple presentations and authentic documents, such as announcements, interviews, and short audio and video clips—on these topics; the development of relevant reading and listening strategies; the mastery of simple grammatical structures and appropriate vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and Learning Formats	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Language proficiency in Arabic at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 - Chinese
Module number	CMS-LN-A2-C
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic communicative competence in Chinese at the A2 level of the Common European Framework of Reference for Languages. Students can comprehend slow and clearly articulated concrete information on everyday topics and understand short texts of simple syntax, semantics, vocabulary, and morphology related to everyday and professional experiences when reading, provided the vocabulary is limited to frequently used and internationally understandable words. They can describe their surroundings orally and in writing using simple phrases and sentences, and can largely follow and respond appropriately to short, simple conversations and very simple presentations when the topic is familiar to them.
Contents	The content of the Chinese module includes simple texts on everyday situations and specific topics—particularly in a university setting—simple presentations, and original documents—such as announcements, interviews, and short audio and video clips—on these topics, the development of relevant reading and listening strategies, the mastery of simple grammatical structures and appropriate vocabulary, as well as exercises to build fluency through various learning formats and media.
Teaching and Learning Formats	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Language proficiency in Chinese at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.

Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 - German as a Foreign Language
Module number	CMS-LN-A2-D
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students possess basic communicative proficiency in German at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend specific information on everyday topics that is presented slowly and clearly articulated; they can read and understand short texts that are simple in terms of syntax, semantics, vocabulary, and morphology and relate to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words. They can describe their surroundings orally and in writing using simple phrases and sentences, and can largely follow and respond appropriately to short, simple conversations and very simple presentations when the topic is familiar to them.
Contents	The content of the German module includes simple texts on everyday situations and specific topics—particularly in a university setting—simple presentations, and authentic documents—such as announcements, interviews, and short audio and video clips—on these topics, the development of relevant reading and listening strategies, the mastery of simple grammatical structures and appropriate vocabulary, as well as exercises to build fluency through various learning formats and media.
Teaching and Learning Formats	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	German language proficiency at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master’s program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master’s program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under “Prerequisites.”
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.

Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 - Finnish
Module number	CMS-LN-A2-FI
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic communicative competence in Finnish at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend slow and clearly articulated concrete information on everyday topics and understand short texts of simple syntax, semantics, vocabulary, and morphology related to everyday and professional experiences when reading, provided the vocabulary is limited to frequently used and internationally understandable words. They can describe their surroundings orally and in writing using simple phrases and sentences, and can largely follow and respond appropriately to short, simple conversations and very simple presentations when the topic is familiar to them.
Contents	The content of the Finnish module includes simple texts on everyday situations and specific topics—particularly in a university setting—simple presentations, and original documents—such as announcements, interviews, and short audio and video clips—on these topics, the development of relevant reading and listening strategies, the mastery of simple grammatical structures and appropriate vocabulary, as well as exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Language proficiency in Finnish at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 - Japanese
Module number	CMS-LN-A2-J
Module coordinator	Ute Meyer ute.meyer@tu-dresden.de
Learning goals	Students will acquire basic communicative competence in Japanese at the A2 level of the Common European Framework of Reference for Languages. Students can comprehend slow and clearly articulated concrete information on everyday topics and understand short texts of simple syntax, semantics, vocabulary, and morphology related to everyday and professional experiences when the vocabulary is limited to frequently used and internationally understandable words. They can describe their surroundings orally and in writing using simple phrases and sentences, and can largely follow and respond appropriately to short, simple conversations and very simple presentations when the topic is familiar to them.
Contents	The content of the Japanese module includes simple texts on everyday situations and specific topics—particularly in a university setting—simple presentations, and original documents—such as announcements, interviews, and short audio and video clips—on these topics, the development of relevant reading and listening strategies, the mastery of simple grammatical structures and appropriate vocabulary, as well as exercises to build fluency through various learning formats and media.
Teaching and Learning Formats	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Japanese language proficiency at the A1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 - Polish
Module number	CMS-LN-A2-PL
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic communicative competence in Polish at the A2 level of the Common European Framework of Reference for Languages. Students can comprehend slow and clearly articulated concrete information on everyday topics and understand short texts of simple syntax, semantics, vocabulary, and morphology related to everyday and professional experiences when reading, provided the vocabulary is limited to frequently used and internationally understandable words. They can describe their surroundings orally and in writing using simple phrases and sentences, and can largely follow and respond appropriately to short, simple conversations and very simple presentations when the topic is familiar to them.
Contents	The content of the Polish module consists of simple texts on everyday situations and specific topics, particularly in a university setting, simple presentations, and original documents—such as announcements, interviews, and short audio and video clips—on these topics, the development of relevant reading and listening strategies, the mastery of simple grammatical structures and appropriate vocabulary, as well as exercises to build fluency through various learning formats and media.
Teaching and Learning Formats	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Language proficiency in Polish at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 - Russian
Module Number	CMS-LN-A2-RU
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic communicative competence in Russian at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend slow and clearly articulated concrete information on everyday topics and understand short texts of simple syntax, semantics, vocabulary, and morphology related to everyday and professional experiences when reading, provided the vocabulary is limited to frequently used and internationally understandable words. They can describe their surroundings orally and in writing using simple phrases and sentences, and can largely follow and respond appropriately to short, simple conversations and very simple presentations when the topic is familiar to them.
Contents	The content of the Russian module includes simple texts on everyday situations and specific topics—particularly in a university setting—simple presentations, and original documents—such as announcements, interviews, and short audio and video clips—on these topics, the development of relevant reading and listening strategies, the mastery of simple grammatical structures and appropriate vocabulary, as well as exercises to build fluency through various learning formats and media.
Teaching and Learning Formats	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Russian language proficiency at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master’s program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master’s program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under “Prerequisites.”
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 - Czech
Module number	CMS-LN-A2-T
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire basic communicative competence in Czech at the A2 level of the Common European Framework of Reference for Languages. Students can comprehend slow and clearly articulated concrete information on everyday topics and understand short texts of simple syntax, semantics, vocabulary, and morphology related to everyday and professional experiences when reading, provided the vocabulary is limited to frequently used and internationally understandable words. They can describe their surroundings orally and in writing using simple phrases and sentences, and can largely follow and respond appropriately to short, simple conversations and very simple presentations when the topic is familiar to them.
Contents	The content of the Czech language module includes simple texts on everyday situations and specific topics—particularly in a university setting—simple presentations, and original documents—such as announcements, interviews, and short audio and video clips—on these topics, the development of relevant reading and listening strategies, the mastery of simple grammatical structures and appropriate vocabulary, as well as exercises to build fluency through various learning formats and media.
Teaching and Learning Formats	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Language proficiency in Czech at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Arabic
Module Number	CMS-LN-A2-1A
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in Arabic at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend clearly articulated, concrete information on everyday topics; read and understand syntactically, semantically, lexically, and morphologically simple texts related to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the Arabic module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the study of grammatical structures and an expanded vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Language proficiency in Arabic at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master’s program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master’s program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under “Prerequisites.”
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - German as a Foreign Language
Module number	CMS-LN-A2-1D
Module coordinator	Ute Meyer ute.meyer@tu-dresden.de
Learning goals	Students will have advanced elementary communicative language proficiency in German at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend clearly articulated, concrete information on everyday topics; read and understand texts that are simple in terms of syntax, semantics, vocabulary, and morphology and relate to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the German module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of grammatical structures and an expanded vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	German language proficiency at Level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.

Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - French
Module Number	CMS-LN-A2-1F
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in French at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend clearly articulated, concrete information on everyday topics; read and understand texts that are simple in terms of syntax, semantics, vocabulary, and morphology and relate to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the French module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of grammatical structures and an expanded vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in French at Level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Italian
Module Number	CMS-LN-A2-1I
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in Italian at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend clearly articulated, concrete information on everyday topics; read and understand syntactically, semantically, lexically, and morphologically simple texts related to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the Italian module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of grammatical structures and an expanded vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Italian at Level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Polish
Module number	CMS-LN-A2-1PL
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in Polish at Level A2 of the Common European Framework of Reference for Languages. Students can grasp clearly articulated, concrete information on everyday topics; read and understand texts that are simple in terms of syntax, semantics, vocabulary, and morphology and relate to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the Polish module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the acquisition of grammatical structures and an expanded vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Language proficiency in Polish at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Portuguese
Module number	CMS-LN-A2-1PG
Module coordinator	Ute Meyer ute.meyer@tu-dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in Portuguese at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend clearly articulated, concrete information on everyday topics; read and understand syntactically, semantically, lexically, and morphologically simple texts related to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the Portuguese module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of grammatical structures and an expanded vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Portuguese at Level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Russian
Module number	CMS-LN-A2-1RU
Module coordinator	Ute Meyer ute.meyer@tu-dresden.de
Learning goals	Students possess advanced elementary communicative language proficiency in Russian at Level A2 of the Common European Framework of Reference for Languages. Students can grasp clearly articulated, concrete information on everyday topics; read and understand texts that are simple in terms of syntax, semantics, vocabulary, and morphology and relate to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the Russian module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of grammatical structures and an expanded vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Russian at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Swedish
Module number	CMS-LN-A2-1SW
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in Swedish at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend clearly articulated, concrete information on everyday topics; read and understand syntactically, semantically, lexically, and morphologically simple texts related to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the Swedish module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of grammatical structures and an expanded vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Swedish at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Spanish
Module number	CMS-LN-A2-1SP
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in Spanish at Level A2 of the Common European Framework of Reference for Languages. Students can comprehend clearly articulated, concrete information on everyday topics; read and understand syntactically, semantically, lexically, and morphologically simple texts related to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple questions.
Contents	The content of the Spanish module includes simple texts and audio recordings related to everyday situations, particularly in a university setting; basic oral and written communication and interaction on these topics; the development of relevant reading and listening strategies; the study of grammatical structures and an expanded vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Spanish language proficiency at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Czech
Module number	CMS-LN-A2-1T
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in Czech at Level A2 of the Common European Framework of Reference for Languages. Students will be able to grasp clearly articulated, concrete information on everyday topics; read and understand syntactically, semantically, lexically, and morphologically simple texts related to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the Czech language module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the mastery of grammatical structures and an expanded vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Language proficiency in Czech at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Chinese
Module number	CMS-LN-A2-1C
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in Chinese at Level A1 of the Common European Framework of Reference for Languages. Students can comprehend clearly articulated, concrete information on everyday topics; read and understand syntactically, semantically, lexically, and morphologically simple texts related to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the Chinese module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the study of grammatical structures and an expanded vocabulary; and exercises to build fluency through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Requirements for Participation	Participants are required to have Chinese language skills at the A1 level of the Common European Framework of Reference for Languages.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 165 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.

Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language A2 Advanced Level - Japanese
Module Number	CMS-LN-A2-1J
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced elementary communicative language proficiency in Japanese at Level A1 of the Common European Framework of Reference for Languages. Students can comprehend clearly articulated, concrete information on everyday topics; read and understand syntactically, semantically, lexically, and morphologically simple texts related to everyday and professional experiences, provided the vocabulary is limited to frequently used and internationally understandable words; recognize different text types, communicate relatively easily in simple, routine situations and use connectors appropriately, describe their surroundings orally and in writing using simple phrases and sentences, and respond to a limited number of simple follow-up questions.
Contents	The content of the Japanese module includes simple texts and audio recordings on everyday situations, particularly in a university setting; basic oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; the study of grammatical structures and an expanded vocabulary; and exercises to reinforce these skills through various learning formats and media.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Japanese language proficiency at level A1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 165 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 - Arabic
Module number	CMS-LN-B1-A
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced basic communicative competence in Arabic at the B1 level of the Common European Framework of Reference for Languages. Students will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in clearly articulated standard Arabic or a familiar variety; largely understand informational texts on topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on topics within their areas of interest; and compose simple formal documents. In doing so, they have mastered communication techniques such as summarizing, arguing, and evaluating, and can take the initiative in conversations.
Contents	The content of the Arabic module includes texts and audio recordings on everyday situations, particularly in a university setting; oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; and the acquisition of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Language proficiency in Arabic at level A2 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master’s program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master’s program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under “Prerequisites.”
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a 105-minute language exam.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the exam grade.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 - German as a Foreign Language
Module number	CMS-LN-B1-D
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced basic communicative competence in German at the B1 level of the Common European Framework of Reference for Languages. Students will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in clearly articulated standard German or a familiar variety of the language; largely understand informational texts on topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on topics within their areas of interest; and compose simple formal documents. In doing so, they have mastered communication techniques such as summarizing, arguing, and evaluating, and can take the initiative in conversations.
Contents	The content of the German module includes texts and audio recordings related to everyday situations, particularly in a university setting; oral and written text production as well as interaction on these topics; the development of relevant reading and listening strategies; and the acquisition of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	German language proficiency at level A2 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 - French
Module number	CMS-LN-B1-F
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced basic communicative competence in French at the B1 level of the Common European Framework of Reference for Languages. Students will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in clearly articulated standard language or a familiar variety; largely understand informational texts on topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on topics within their areas of interest; and compose simple formal documents. In doing so, they have mastered communication techniques such as summarizing, arguing, and evaluating, and can take the initiative in conversations.
Contents	The content of the French module includes texts and audio recordings on everyday situations, particularly in a university setting; oral and written text production as well as interaction on these topics; the development of relevant reading and listening strategies; and the mastery of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in French at level A2 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module spans 1 semester.

Module name	Foreign Language B1 - Italian
Module number	CMS-LN-B1-I
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced basic communicative competence in Italian at the B1 level of the Common European Framework of Reference for Languages. Students will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in clearly articulated standard language or a familiar variety; largely understand informational texts on topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on topics within their areas of interest; and compose simple formal documents. In doing so, they have mastered communication techniques such as summarizing, arguing, and evaluating, and can take the initiative in conversations.
Contents	The content of the Italian module includes texts and audio recordings on everyday situations, particularly in a university setting; oral and written text production as well as interaction on these topics; the development of relevant reading and listening strategies; and the mastery of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Italian at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 - Portuguese
Module number	CMS-LN-B1-PG
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced basic communicative competence in Portuguese at the B1 level of the Common European Framework of Reference for Languages. Students will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in clearly articulated standard language or a familiar variety; largely understand informational texts on topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on topics within their areas of interest; and compose simple formal documents. In doing so, they have mastered communication techniques such as summarizing, arguing, and evaluating, and can take the initiative in conversations.
Contents	The content of the Portuguese module includes texts and audio recordings on everyday situations, particularly in a university setting; oral and written text production as well as interaction on these topics; the development of relevant reading and listening strategies; and the acquisition of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Portuguese at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 - Russian
Module number	CMS-LN-B1-RU
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced basic communicative competence in Russian at Level B1 of the Common European Framework of Reference for Languages. Students will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in clearly articulated standard Russian or a familiar variety of the language; largely understand informational texts on topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on topics within their areas of interest; and compose simple formal documents. In doing so, they have mastered communication techniques such as summarizing, arguing, and evaluating, and can take the initiative in conversations.
Contents	The content of the Russian module includes texts and audio recordings on everyday situations, particularly in a university setting; oral and written text production as well as interaction on these topics; the development of relevant reading and listening strategies; and the acquisition of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Russian at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 - Spanish
Module number	CMS-LN-B1-SP
	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced basic communicative competence in Spanish at the B1 level of the Common European Framework of Reference for Languages. Students will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in clearly articulated standard language or a familiar variety; largely understand informational texts on topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on topics within their areas of interest; and compose simple formal documents. In doing so, they have mastered communication techniques such as summarizing, arguing, and evaluating, and can take the initiative in conversations.
Contents	The content of the Spanish module includes texts and audio recordings related to everyday situations, particularly in a university setting; oral and written text production and interaction on these topics; the development of relevant reading and listening strategies; and the mastery of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Spanish language proficiency at level A2 of the Common European Framework of Reference for Languages is required.
Applicability	In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 - Chinese
Module number	CMS-LN-B1-C
	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students possess advanced basic communicative proficiency in Chinese at the B1 level of the Common European Framework of Reference for Languages. They can understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in clearly articulated standard Chinese; they can largely understand simple informational texts on topics related to their own interests and fields of study; they can express themselves more thoroughly and coherently, both orally and in writing, on topics within their areas of interest; and they can compose simple formal documents. In doing so, you have mastered communication techniques such as summarizing, arguing, and evaluating, and can take the initiative in conversations
Contents	The content of the Chinese module includes texts and audio recordings in simplified Chinese on everyday situations, particularly in the university setting; oral and written text production and interaction on these topics; the development of relevant reading and speaking strategies; and the acquisition of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Chinese at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 75-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 - Japanese
Module number	CMS-LN-B1-J
	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will have advanced basic communicative competence in Japanese at the B1 level of the Common European Framework of Reference for Languages. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in clearly articulated standard Japanese; largely understand simple informational texts on topics related to their own interests and fields of study; express themselves more thoroughly and coherently, both orally and in writing, on topics within their areas of interest; and compose simple formal documents. In doing so, you have mastered communication techniques such as summarizing, arguing, and evaluating, and can take the initiative in conversations
Contents	The content of the Japanese module includes texts and audio recordings on everyday situations, particularly in the university setting; oral and written text production as well as interaction on these topics; writing longer texts on topics related to their own university environment; developing relevant writing and listening strategies; and mastering grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Japanese at level A2 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - Arabic
Module number	CMS-LN-B1-1A
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced productive and receptive skills in Arabic at the B1 level of the Common European Framework of Reference for Languages. Students will have sufficient language skills to complete an internship abroad or participate in courses at a foreign university in the local language. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in standard language or a familiar variety, largely understand factual texts on abstract and concrete topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on past, present, and future topics within their areas of interest; and compose official documents.
Contents	The module's content in Arabic includes texts and audio recordings related to everyday situations—particularly in a university setting—oral expression and interaction on these topics, writing longer texts on topics related to one's own university environment, and the development of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Arabic at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - German as a Foreign Language
Module number	CMS-LN-B1-1D
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will have advanced productive and receptive German language skills at the B1 level of the Common European Framework of Reference for Languages. Students will have sufficient language skills to complete an internship abroad or participate in courses at a foreign university in the local language. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in standard language or a familiar variety, largely understand factual texts on abstract and concrete topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on past, present, and future topics within their areas of interest; and compose official documents.
Contents	The content of the German module includes texts and audio recordings on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to one's own academic field; and the development of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	German language proficiency at level A2 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - French
Module number	CMS-LN-B1-1FR
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced productive and receptive skills in French at the B1 level of the Common European Framework of Reference for Languages. Students will have sufficient language skills to complete an internship abroad or participate in courses at a foreign university in the local language. They will be able to understand the main points of spoken texts on topics related to everyday life and the academic environment when spoken in standard language or a familiar variety, largely understand factual texts on abstract and concrete topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on past, present, and future topics within their areas of interest; and compose official documents.
Contents	The content of the French module includes texts and audio recordings on everyday situations, particularly in the university setting; oral production and interaction on these topics; writing longer texts on topics related to one's own academic field; and the development of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in French at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - Italian
Module number	CMS-LN-B1-1I
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced productive and receptive skills in Italian at the B1 level of the Common European Framework of Reference for Languages. Students will have sufficient language skills to complete an internship abroad or participate in courses at a foreign university in the local language. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in standard language or a familiar variety, largely understand factual texts on abstract and concrete topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on past, present, and future topics within their areas of interest; and compose official documents.
Content	The content of the Italian module includes texts and audio recordings on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to one's own university environment; and the development of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Italian at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - Russian
Module number	CMS-LN-B1-1RU
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced productive and receptive skills in Russian at the B1 level of the Common European Framework of Reference for Languages. Students will have sufficient language skills to complete an internship abroad or participate in courses at a foreign university in the local language. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in standard language or a familiar variety, largely understand factual texts on abstract and concrete topics related to their own interests and fields of study, express themselves in detail and coherently—both orally and in writing—on past, present, and future topics within their areas of interest, and compose official documents.
Contents	The content of the Russian module includes texts and audio recordings on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to one's own university environment; and the development of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Russian at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - Swedish
Module number	CMS-LN-B1-1SW
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced productive and receptive skills in Swedish at the B1 level of the Common European Framework of Reference for Languages. Students will have sufficient language skills to complete an internship abroad or participate in courses at a foreign university in the local language. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in standard language or a familiar variety, largely understand factual texts on abstract and concrete topics related to their own interests and fields of study; express themselves in detail and coherently, both orally and in writing, on past, present, and future topics within their areas of interest; and compose official documents.
Content	The content of the Swedish module includes texts and audio recordings on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to one's own academic field; and the development of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Swedish at level A2 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - Spanish
Module number	CMS-LN-B1-1SP
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced productive and receptive skills in Spanish at the B1 level of the Common European Framework of Reference for Languages. Students will have sufficient language skills to complete an internship abroad or participate in courses at a foreign university in the local language. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in standard language or a familiar variety, largely understand factual texts on abstract and concrete topics related to their own interests and fields of study, express themselves in detail and coherently—both orally and in writing—on past, present, and future topics within their areas of interest, and compose official documents.
Content	The content of the Spanish module includes texts and audio recordings on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to one's own university environment; and the development of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Spanish language proficiency at level A2 of the Common European Framework of Reference for Languages is required.
Applicability	In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for the Awarding of Credit Points	Credit points are awarded upon passing the module exam. The module exam consists of a 105-minute language exam.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the exam grade.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - Portuguese
Module number	CMS-LN-B1-1PG
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced productive and receptive skills in Portuguese at the B1 level of the Common European Framework of Reference for Languages. Students will have sufficient language skills to complete an internship abroad or participate in courses at a foreign university in the local language. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in standard language or a familiar variety, largely understand factual texts on abstract and concrete topics related to their own interests and fields of study, express themselves in detail and coherently—both orally and in writing—on past, present, and future topics within their areas of interest, and compose official documents.
Content	The content of the Portuguese module includes texts and audio recordings on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to one's own academic environment; and the development of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Portuguese at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 105 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - Chinese
Module number	CMS-LN-B1-1C
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced productive and receptive skills in Chinese at the B1 level of the Common European Framework of Reference for Languages. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in standard Chinese; largely understand informational texts on abstract and concrete topics related to their own interests and fields of study; express themselves more thoroughly and coherently, both orally and in writing, on past, present, and future topics within their areas of interest; and compose simple formal documents.
Contents	The content of the Chinese module includes texts and audio recordings on everyday situations, particularly in the university setting; oral and written text production as well as interaction on these topics; writing longer texts on topics related to one's own university environment; developing relevant writing and listening strategies; and mastering grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Chinese at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B1 Advanced Level - Japanese
Module Number	CMS-LN-B1-1J
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced productive and receptive skills in Japanese at the B1 level of the Common European Framework of Reference for Languages. They will be able to understand the main points of spoken texts on topics related to everyday life and the university environment when spoken in standard Japanese; largely understand informational texts on abstract and concrete topics related to their own interests and fields of study; express themselves more thoroughly and coherently, both orally and in writing, on past, present, and future topics within their areas of interest; and compose simple formal documents.
Content	The content of the Japanese module includes texts and audio recordings on everyday situations, particularly in the university setting; oral interaction on these topics; the development of relevant reading and speaking strategies; and the study of grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Japanese at the A2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 75-minute language exam.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B2 - German as a Foreign Language
Module number	CMS-LN-B2-D
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire productive and receptive German language skills at the B2 level of the Common European Framework of Reference for Languages. Students will have the language proficiency required to complete an internship abroad or to participate in courses at a foreign university in the local language. They can summarize information in a structured manner from complex texts covering a wide range of topics related to everyday life and their own university environment; effectively express their viewpoints in writing and orally; respond appropriately to others' positions; and use appropriate formalities and conventions in written correspondence. Students possess intercultural competence.
Contents	The module's content in German includes texts on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to their own university environment; and dealing with complex grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	German language proficiency at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 150 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B2 - French
Module number	CMS-LN-B2-FR
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire productive and receptive skills in French at the B2 level of the Common European Framework of Reference for Languages. Students will have the language proficiency required to complete an internship abroad or to participate in courses at a foreign university in the local language. They can summarize information in a structured manner from complex texts covering a wide range of topics related to everyday life and their own university environment; effectively express their viewpoints in writing and orally; respond appropriately to others' positions; and use appropriate formalities and conventions in written correspondence. Students possess intercultural competence.
Contents	The content of the module in French includes texts on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to their own university environment; and dealing with complex grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in French at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 150 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B2 - Italian
Module number	CMS-LN-B2-I
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire productive and receptive Italian language skills at the B2 level of the Common European Framework of Reference for Languages. Students will have the language proficiency required to complete an internship abroad or to participate in courses at a foreign university in the local language. They can summarize information in a structured manner from complex texts covering a wide range of topics related to everyday life and their own university environment; effectively express their viewpoints in writing and orally; respond appropriately to others' positions; and use appropriate formalities and conventions in written correspondence. Students possess intercultural competence.
Contents	The content of the module in Italian includes texts on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to their own university environment; and dealing with complex grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Italian at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 150 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B2 - Portuguese
Module number	CMS-LN-B2-PG
Module coordinator	Ute Meyer ute.meyer@tu-dresden.de
Learning goals	Students will acquire productive and receptive proficiency in Portuguese at the B2 level of the Common European Framework of Reference for Languages. Students will have the linguistic competence to complete an internship abroad or to participate in courses at a foreign university in the local language. They can summarize information in a structured manner from complex texts covering a wide range of topics related to everyday life and their own university environment; effectively express their viewpoints in writing and orally; respond appropriately to others' positions; and use appropriate formalities and conventions in written correspondence. Students possess intercultural competence.
Course Content	The content of the Portuguese module includes texts on everyday situations, particularly in a university setting; oral expression and interaction on these topics; writing longer texts on topics related to one's own university environment; and working with complex grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module consists of language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Portuguese at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 150 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B2 - Russian
Module number	CMS-LN-B2-RU
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire productive and receptive Russian language skills at the B2 level of the Common European Framework of Reference for Languages. Students will have the language proficiency required to complete an internship abroad or to participate in courses at a foreign university in the local language. They can summarize information in a structured manner from complex texts covering a wide range of topics related to everyday life and their own university environment; effectively express their viewpoints in writing and orally; respond appropriately to others' positions; and use appropriate formalities and conventions in written correspondence. Students possess intercultural competence.
Contents	The content of the module in Russian includes texts on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to their own university environment; and dealing with complex grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Russian at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 150 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B2 - Spanish
Module number	CMS-LN-B2-SP
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire productive and receptive skills in Spanish at the B2 level of the Common European Framework of Reference for Languages. Students will have the linguistic competence to complete an internship abroad or to participate in courses at a foreign university in the local language. They can summarize information in a structured manner from complex texts covering a wide range of topics related to everyday life and their own university environment; effectively express their viewpoints in writing and orally; respond appropriately to others' positions; and use appropriate formalities and conventions in written correspondence. Students possess intercultural competence.
Contents	The content of the module in Spanish includes texts on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to their own university environment; and dealing with complex grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Spanish language proficiency at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 150 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foreign Language B2 - Swedish
Module number	CMS-LN-B2-SW
Module coordinator	Ute Meyer ute.meyer@tu-dresden.de
Learning goals	Students will acquire productive and receptive skills in Swedish at the B2 level of the Common European Framework of Reference for Languages. Students will have the linguistic competence to complete an internship abroad or to participate in courses at a foreign university in the local language. They can summarize information in a structured manner from complex texts covering a wide range of topics related to everyday life and their own university environment; effectively express their viewpoints in writing and orally; respond appropriately to others' positions; and use appropriate formalities and conventions in written correspondence. Students possess intercultural competence.
Contents	The module's content in Swedish includes texts on everyday situations, particularly in the university setting; oral text production and interaction on these topics; writing longer texts on topics related to their own university environment; and dealing with complex grammatical structures and an expanded vocabulary.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Swedish at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 150 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Academic Competencies - B2 Advanced Level - German as a Foreign Language
Module number	CMS-LN-B2-1D
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced German language skills for independent, subject-specific written and oral communication at Level B2 of the Common European Framework of Reference for Languages. Students can largely understand complex oral academic texts, express themselves clearly and fluently on selected topics in their field of study in detail and using complex linguistic structures, and employ a variety of strategies to ensure comprehension. Students possess intercultural competence.
Contents	The content of the module in German includes the fundamentals of academic language, listening strategies, the comprehension and production of subject-specific and academic texts, and the preparation of presentations with Q&A sessions.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	German language proficiency at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Academic Competencies - B2 Advanced Level - French
Module number	CMS-LN-B2-1F
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced proficiency in French, enabling them to communicate independently in writing and orally on subject-specific topics at the B2 level of the Common European Framework of Reference for Languages. Students can largely understand complex oral academic texts, express themselves clearly and fluently on selected topics in their field of study in detail and using complex linguistic structures, and employ a variety of strategies to ensure comprehension. Students possess intercultural competence.
Contents	The content of the module in French includes the fundamentals of academic language, listening strategies, the comprehension and production of subject-specific and academic texts, and the preparation of presentations with Q&A sessions.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in French at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Academic Competencies - B2 Advanced Level - Russian
Module number	CMS-LN-B2-1RU
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced proficiency in Russian, enabling them to communicate independently in writing and orally on subject-specific topics at the B2 level of the Common European Framework of Reference for Languages. Students can largely understand complex oral academic texts, express themselves clearly and fluently on selected topics in their field of study in detail and using complex linguistic structures, and employ a variety of strategies to ensure comprehension. Students possess intercultural competence.
Contents	The content of the module in Russian includes the fundamentals of academic language, listening strategies, the comprehension and production of subject-specific and academic texts, and the preparation of presentations with Q&A sessions.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Russian at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Academic Competencies - B2 Advanced Level - Spanish
Module number	CMS-LN-B2-1SP
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced proficiency in Spanish, enabling them to communicate independently in writing and orally on subject-specific topics at the B2 level of the Common European Framework of Reference for Languages. Students can largely understand complex oral academic texts, express themselves clearly and fluently on selected topics in their field of study in detail and using complex linguistic structures, and employ a variety of strategies to ensure comprehension. Students possess intercultural competence.
Contents	The content of the module in Spanish includes the fundamentals of academic language, listening strategies, the comprehension and production of subject-specific and academic texts, and the preparation of presentations with Q&A sessions.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Spanish language proficiency at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Professional Language Competencies - B2 Advanced Level - German as a Foreign Language
Module number	CMS-LN-B2B-D
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced German language skills for independent, profession-related written and oral communication at Level B2 of the Common European Framework of Reference for Languages. Students can largely understand professional texts presented in writing or orally, express themselves clearly and fluently in detail on selected topics within their field using complex linguistic structures, and employ a variety of strategies to ensure comprehension. Students possess interdisciplinary and action-oriented skills and abilities to support written and oral communication in their daily professional lives. In addition, they possess intercultural competence.
Contents	The content of the module in German includes communication about economic sectors and industries as well as occupational and job profiles, the fundamentals of business communication, simulations of job-specific communication scenarios, the development of written communication skills, and job application training.
Teaching and learning methods	The module includes language courses totaling 4 SWS and self-study.
Prerequisites	German language proficiency at Level B1 of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Professional Language Competencies - B2 Advanced Level - French
Module number	CMS-LN-B2B-FR
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced proficiency in French for independent, profession-related written and oral communication at Level B2 of the Common European Framework of Reference for Languages. Students can largely understand professional texts presented in writing or orally, express themselves clearly and fluently in detail on selected topics within their field using complex linguistic structures, and employ a variety of strategies to ensure comprehension. Students possess cross-disciplinary and action-oriented skills and abilities to support written and oral communication in their daily professional lives. In addition, they possess intercultural competence.
Contents	The module's content in French includes communication related to economic sectors and industries, as well as job and career profiles; the fundamentals of business communication; simulations of job-specific communication scenarios; the development of written communication skills; and job application training.
Teaching and learning methods	The module includes language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in French at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Professional Language Competencies - B2 Advanced Level - Russian
Module number	CMS-LN-B2B-RU
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced Russian language skills for independent, profession-related written and oral communication at Level B2 of the Common European Framework of Reference for Languages. Students can largely understand professional texts presented in writing or orally, express themselves clearly and fluently in detail on selected topics within their field using complex linguistic structures, and employ a variety of strategies to ensure comprehension. Students possess interdisciplinary and action-oriented skills and abilities to support written and oral communication in everyday professional life. In addition, they possess intercultural competence.
Content	The content of the Russian-language module includes communication related to economic sectors and industries, as well as job and activity profiles; the fundamentals of business communication; simulations of job-specific communication scenarios; the development of written communication skills; and job application training.
Teaching and learning methods	The module includes language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Russian at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Professional Language Competencies - B2 Advanced Level - Spanish
Module number	CMS-LN-B2B-SP
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire advanced proficiency in Spanish for independent, professional-level written and oral communication at Level B2 of the Common European Framework of Reference for Languages. Students can largely understand professional texts presented in writing or orally, express themselves clearly and fluently in detail on selected topics within their field using complex linguistic structures, and employ a variety of strategies to ensure comprehension. Students possess interdisciplinary and action-oriented skills and abilities to support written and oral communication in their daily professional lives. In addition, they possess intercultural competence.
Content	The content of the module in Spanish includes communication related to economic sectors and industries, as well as professional and job profiles; the fundamentals of business communication; simulations of job-specific communication scenarios; the development of written communication skills; and job application training.
Teaching and learning methods	The module includes language courses totaling 4 SWS and self-study.
Prerequisites	Spanish language proficiency at the B1 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Academic Competencies C1 - German as a Foreign Language
Module number	CMS-LN-C1-D
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will be able to communicate independently in German, both in writing and orally, on subject-specific topics at the C1 level of the Common European Framework of Reference for Languages. Students can understand complex oral academic texts, express themselves clearly and fluently in detail on topics within their field of study using complex linguistic structures and an extensive general and specialized vocabulary, follow and participate in complex interactions during discussions—even on abstract and complex topics—and use language flexibly and effectively, including to express figures of speech such as irony, allusions, metaphors. Students possess intercultural competence.
Contents	The content of the German module includes the expansion of academic language skills, listening strategies, the comprehension and production of subject-specific and academic texts, as well as the preparation of presentations followed by discussion.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	German language proficiency at the B2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Academic Competencies C1 - French
Module number	CMS-LN-C1-FR
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will be able to communicate independently in French, both in writing and orally, on subject-specific topics at the C1 level of the Common European Framework of Reference for Languages. Students can understand complex oral academic texts; express themselves clearly and fluently on topics within their field of study in detail, using complex linguistic structures and a wide range of general and specialized vocabulary; follow and participate in complex interactions during discussions, even on abstract and complex topics; and use language flexibly and effectively, including to express figures of speech such as irony, allusions, metaphors. Students possess intercultural competence.
Contents	The content of the module in French includes the expansion of academic language skills, listening strategies, the comprehension and production of subject-specific and academic texts, as well as the preparation of presentations followed by discussion.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in French at the B2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Academic Competencies C1 - Russian
Module number	CMS-LN-C1-RU
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will be able to communicate independently in Russian, both in writing and orally, on subject-specific topics at the C1 level of the Common European Framework of Reference for Languages. Students can understand complex oral academic texts; express themselves clearly and fluently on topics within their field of study in detail, using complex linguistic structures and a wide range of general and specialized vocabulary; follow and participate in complex interactions during discussions, even on abstract and complex topics; and use language flexibly and effectively, including to express figures of speech such as irony, allusions, metaphors. Students possess intercultural competence.
Contents	The content of the module in Russian includes the expansion of academic language skills, listening strategies, the comprehension and production of subject-specific and academic texts, as well as the preparation of presentations followed by discussion.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in Russian at the B2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Academic Competencies C1 - Spanish
Module number	CMS-LN-C1-SP
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire the ability to communicate independently in Spanish, both in writing and orally, on subject-specific topics at the C1 level of the Common European Framework of Reference for Languages. Students can understand complex oral academic texts; express themselves clearly and fluently on topics within their field of study in detail, using complex linguistic structures and a wide range of general and specialized vocabulary; follow and participate in complex interactions during discussions, even on abstract and complex topics; and use language flexibly and effectively, including to express figures of speech such as irony, allusions, metaphors. Students possess intercultural competence.
Contents	The content of the module in Spanish includes the expansion of academic language skills, listening strategies, the comprehension and production of subject-specific and academic texts, as well as the preparation of presentations followed by discussion.
Teaching and learning methods	The module comprises language courses totaling 4 SWS and self-study.
Prerequisites	Spanish language proficiency at the B2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Professional Language Competencies C1 - German as a Foreign Language
Module Number	CMS-LN-C1B-D
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students will acquire the ability to communicate independently in German in a professional context, both in writing and orally, at Level C1 of the Common European Framework of Reference for Languages. Students can understand complex and abstract professional texts, whether written or presented orally; follow extended discourse even when it is not clearly structured; express themselves clearly and fluently in detail using complex linguistic structures specific to their field; and employ a variety of strategies to ensure comprehension. Students possess cross-disciplinary and action-oriented skills and abilities to support written and oral communication in their daily professional lives. In addition, they possess intercultural competence.
Content	The content of the module in German includes communication about economic sectors and industries as well as occupational and job profiles, the fundamentals of business communication, simulations of job-specific communication scenarios, the development of written communication skills, and job application training.
Teaching and learning methods	The module includes language courses totaling 4 SWS and self-study.
Prerequisites	German language proficiency at the B2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Professional Language Competencies C1 - French
Module number	CMS-LN-C1B-F
Module coordinator	Ute Meyer ute.meyer@tu-dresden.de
Learning goals	Students will acquire the ability to communicate independently in French in professional contexts, both in writing and orally, at Level C1 of the Common European Framework of Reference for Languages. Students can understand complex and abstract professional texts, whether written or spoken; follow extended discourse even when it is not clearly structured; express themselves clearly and fluently in detail using complex linguistic structures specific to their field; and employ a variety of strategies to ensure comprehension. Students possess cross-disciplinary and action-oriented skills and abilities to support written and oral communication in their daily professional lives. In addition, they possess intercultural competence.
Content	The content of the module in French includes communication about economic sectors and industries as well as occupational and job profiles, the fundamentals of business communication, simulations of job-specific communication scenarios, the development of written communication skills, and job application training.
Teaching and learning methods	The module includes language courses totaling 4 SWS and self-study.
Prerequisites	Proficiency in French at the B2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Professional Language Competencies C1 - Spanish
Module number	CMS-LN-C1B-SP
Module coordinator	Ute Meyer ute.meyer@TU Dresden.de
Learning goals	Students possess the ability to communicate independently in Spanish—both in writing and orally—in a professional context at the C1 level of the Common European Framework of Reference for Languages. Students can understand complex and abstract professional texts, whether written or presented orally; follow extended discourse even when it is not clearly structured; express themselves clearly and fluently in detail using complex linguistic structures specific to their field; and employ a variety of strategies to ensure comprehension. Students possess cross-disciplinary and action-oriented skills and abilities to support written and oral communication in their daily professional lives. In addition, they possess intercultural competence.
Content	The content of the module in Spanish includes communication related to economic sectors and industries, as well as professional and job profiles; the fundamentals of business communication; simulations of job-specific communication scenarios; the development of written communication skills; and job application training.
Teaching and learning methods	The module includes language courses totaling 4 SWS and self-study.
Prerequisites	Spanish language proficiency at the B2 level of the Common European Framework of Reference for Languages is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational language training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a language exam lasting 100 minutes.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Literature Studies in Deep Learning for Applied Image Analysis
Module Number	CMS-SEM-DLAIA
Module coordinator	Prof. Dr. Martin Weigert martin.weigert@tu-dresden.de
Learning goals	Students will be able to independently familiarize themselves with current deep learning methods for image analysis, particularly as applied to biomedical imaging. They will be able to understand current scientific publications in this field, present their central concepts and research findings clearly in English, and respond to questions in a well-reasoned manner during discussions.
Course Content	The module covers current deep learning methods for image analysis, including image classification, object detection and segmentation, object tracking, and generative models. Additional topics include fundamental model architectures such as convolutional neural networks (CNNs), transformers, and diffusion models.
Teaching and Learning Formats	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	Basic knowledge of linear algebra, computer programming, and machine learning at the bachelor's level is required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module within the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Literature Studies in Computational Engineering
Module number	CMS-SEM-CE
Module coordinator	Prof. Dr. Michael Beitelschmidt michael.beitelschmidt@tu-dresden.de
Learning goals	Students will be able to independently study and present the content of scientific publications in the field of Computational Engineering and critically analyze the knowledge they have acquired.
Content	The module covers the analysis and discussion of scientific publications in the field of Computational Engineering.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	General knowledge of engineering at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination conducted as a group exam lasting 30 minutes. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Literature Studies in Computer Graphics and Visualization
Module number	CMS-SEM-CGV
Module coordinator	Prof. Dr. Stefan Gumhold
Learning goals	Students will be able to independently research and critically analyze a problem in the field of computer graphics and visualization based on scientific publications. They will be able to present this knowledge clearly in English and respond to questions.
Content	The module covers concepts, methods, and current topics in computer graphics and visualization, with a particular focus on evolving areas such as machine learning for computer graphics, human models in computer graphics, and 3D scene reconstruction.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	Knowledge of computer graphics and visualization at the bachelor's level is required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module within the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Literature Studies in Combinatorial Image Analysis
Module number	CMS-SEM-CIA
Module coordinator	Prof. Dr. Bjoern Andres bjoern.andres@tu-dresden.de
Learning goals	Students will be able to independently explore scientific questions in the field of combinatorial optimization for image analysis, select appropriate methods from the literature, and critically evaluate their application. They will be able to present this knowledge clearly and scientifically in English and respond to questions.
Content	The content of the module is, at the student's discretion, either a combinatorial problem or a method with applications to image analysis.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	Knowledge of linear and combinatorial optimization at the bachelor's level is required. The following literature is recommended for preparation: Introduction to Linear Optimization. Dimitris Bertsimas, John N. Tsitsiklis. Athena Scientific, 1996. ISBN 978-1-886 52919-9.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Literature Studies in Computational Life Science
Module number	CMS-SEM-CLS
Module coordinator	Prof. Dr. Ivo Sbalzarini ivo.sbalzarini@tu-dresden.de
Learning goals	Students will be able to independently study the content of scientific publications in topics related to computational life sciences, present this content clearly to others, and critically analyze the knowledge they have acquired. They will be able to critically analyze and explain the application of computational modeling methods in the life sciences and identify cross-disciplinary approaches.
Content	The module covers classic and current research and application topics in computational modeling and simulation, with a focus on computational life sciences, including the analysis and discussion of published scientific papers.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	No prior knowledge is required.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Literature Studies in Computational Metrology
Module number	CMS-SEM-CM
Module coordinator	Prof. Dr. Jürgen Czarske juergen.czarske@tu-dresden.de
Learning goals	Students will be able to apply their skills and abilities independently, individually, and as part of a team to solve a given problem. They will be proficient in documenting the steps of their work and will be able to present and discuss the results.
Course Content	The module covers specific topics and issues in measurement system technology and digital signal processing using neural networks in various application areas, as well as the methodology of scientific and project-based work.
Teaching and Learning Formats	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Literature Studies in Computing
Module number	CMS-SEM-CP
Module coordinator	Jun. Prof. Dr. Matthew McGinity matthew.mcginity@TU Dresden
Learning goals	Students will be able to locate, read, analyze, and write academic texts. They will be able to write an overview of an academic topic and present it. Students will master the structuring of academic arguments and will be able to participate in an academic debate.
Course Content	The module covers academic research methods and tools, including literature search engines and search strategies, compiling a bibliography, academic writing styles and the structure of academic papers, citations and plagiarism prevention, as well as historical and contemporary texts from computer science and related disciplines, and the limits of research in computer science.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 90 hours.
Duration of the module	The module lasts 1 semester.

Module name	Literature Studies in Computer Vision
Module number	CMS-SEM-CV
Module coordinator	Prof. Dr. Björn Andres bjoern.andres@tu-dresden.de
Learning goals	Students will be able to independently acquire knowledge regarding optimization problems and algorithms in the field of computer vision from the literature. They will be able to present this knowledge clearly and scientifically in English and respond to questions.
Content	The content of the module is, at the student's discretion, an optimization problem or method from the field of computer vision.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	Students are expected to have acquired the competencies covered in the CMS-COR-ML Machine Learning module.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational training in scientific methodology, to be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit Hours and Grades	Students can earn 3 credit points for this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module lasts 1 semester.

Module name	Literature Studies in Knowledge Graph Representation Learning
Module number	CMS-SEM-KGRL
Module coordinator	Hon. Prof. Dr. Jens Lehmann jens.lehmann@tu-dresden.de
Learning goals	Students will be able to independently acquire knowledge on the topic of Knowledge Graph Representation Learning from the literature. They will be able to present this knowledge clearly in English and respond to questions.
Contents	The module covers methods for the automatic learning of feature representations for knowledge graphs.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Literature Studies in Knowledge Representation and Reasoning
Module number	CMS-SEM-KR
Module coordinator	Prof. Dr. Sebastian Rudolph sebastian.rudolph@tu-dresden.de
Learning goals	Students will be able to independently conduct literature reviews in the field of logic-based knowledge representation. They will be able to gain an overview of the current state of research in a subfield of knowledge representation and document the results of such literature reviews in writing. Furthermore, they will be able to present these results to a specialist audience and respond to questions from the audience.
Course Content	The course covers topics in logic-based knowledge representation, in particular logic-based formalisms for representing knowledge, their computability and complexity properties, as well as inference algorithms and their implementation.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	Knowledge of propositional and predicate logic, as well as a basic understanding of computability and complexity theory at the bachelor's level, is required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module within the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module lasts one semester.

Module name	Literature Studies in Mathematical Biology
Module Number	CMS-SEM-MB
Module coordinator	Prof. Dr. Andreas Deutsch andreas.deutsch@tu-dresden.de
Learning goals	Students are familiar with publications on concepts in mathematical biology, can critically evaluate them, and discuss them with regard to the choice of modeling formalisms used. They are aware of the model assumptions made explicitly or implicitly and the inherent limitations of the modeling formalisms employed.
Course Content	The module covers mathematical biology, with a particular focus on theoretical analyses and mathematical models that describe the principles governing the structure, development, and behavior of biological systems. Additional topics include nonlinear dynamics, pattern formation, self-organization, evolution, and machine learning.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	Knowledge of ordinary differential equations, partial differential equations, agent-based models, and numerical simulation algorithms at the bachelor’s level is required.
Applicability	In the master’s program in Computational Modeling and Simulation, this module is an elective compulsory module within the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master’s program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under “Prerequisites.”
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Literature Studies in Machine Learning
Module number	CMS-SEM-ML
Module coordinator	Prof. Dr. Björn Andres bjoern.andres@tu-dresden.de
Learning goals	Students will be able to independently acquire knowledge regarding decision-making and optimization problems as well as machine learning algorithms from the literature. They will be able to present this knowledge clearly and scientifically in English and respond to questions.
Content	The content of the module is, at the student's discretion, a decision-making problem, an optimization problem, or a method from the field of machine learning.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	Students are expected to have acquired the competencies covered in the CMS-COR-ML Machine Learning module.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational training in scientific methodology, to be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Literature Studies on Software Methods and Technologies for Virtual Aircraft
Module number	CMS-SEM-SP
Module coordinator	Prof. Dr. Sabine Roller sabine.roller@TU Dresden.de
Learning goals	Students will be able to analyze and discuss academic publications on a topic related to software methods and technologies for the virtual aircraft. They will be able to independently study the content of the publications and comprehensively present the results of their literature review.
Course Content	The module covers the analysis and discussion of scientific publications on a topic of the student's choice from the fields of computational fluid dynamics, computational mathematics, computational engineering, or high-performance computing.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and independent study. The language of instruction for the seminars is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational training in scientific methodology, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual exam lasting 30 minutes. The language of the examination is English.
Credits and Grades	A total of 3 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 90 hours.
Duration of the module	The module spans 1 semester.

Module name	Digital Circuit Design
Module number	CMS-TRK-DCD
Module coordinator	Prof. Dr. Christian Georg Mayr christian.mayr@TU Dresden.de
Learning goals	Students will understand the functioning and fundamental design principles of digital circuits. Building on their knowledge of active semiconductor device models, they will learn the systematic design and analysis of basic digital and mixed-signal circuits. They understand the architectural and system concepts of complex digital systems and are familiar with the circuit-level characteristics of nanoscale CMOS technologies, methods for reducing power dissipation, measures to increase processing speed in high-speed circuits and interfaces, and the consideration of statistical effects of manufacturing technologies.
Contents	The module covers the analysis, sizing, and optimization of basic digital combinational and sequential elements based on current semiconductor technologies, such as CMOS and BiCMOS; the design of complex logic functions in the form of arithmetic-logic circuits, such as ALUs, shifters and multipliers; finite-state machines; flip-flop and oscillator circuits; digital architecture and system concepts such as register-transfer logic, memory architectures—in particular DRAM, SRAM, EPROM, and mixed-signal circuits, such as ADCs, DACs, and interfaces, as well as methodologies for designing complex digital and mixed-signal systems, such as behavioral description, optimization, and validation.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both the lectures and the exercises is English.
Prerequisites	A basic knowledge of electrical engineering, systems theory, and mathematics at the bachelor's level is required.
Applicability	This module is a required module in the Applied Artificial Intelligence track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam is conducted in English.
Credits and Grades	A total of 5 credit points can be earned for this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts one semester.

Module name	Climatology and Hydrology
Module Number	CMS-TRK-ES7
Module coordinator	PD Dr. Thomas Wöhling thomas.woehling@tu-dresden.de
Learning goals	Students will be able to critically analyze meteorological and hydrological information and apply it to water management tasks such as planning, design, management, and infrastructure. They will be familiar with key processes in the atmosphere and hydrosphere, as well as methods for observing and modeling them, particularly the fundamental principles and estimation methods for all components of the water cycle.
Contents	The module covers the essential fundamentals of processes in the atmosphere and hydrosphere, energy and water balances from a physical perspective, radiation, precipitation, evaporation, surface and subsurface runoff, and water and energy storage. Additional topics include the climate of the boundary layer based on site characteristics, as well as the radiation, energy, and water balances; exemplary land uses; and the macroclimate, its fundamentals, and its variability.
Teaching and learning methods	The module consists of lectures totaling 4 SWS and self-study. The language of instruction for the lectures may be German or English; the specific language will be determined by the Module coordinator at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of the fundamentals of physics and mathematics at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam is conducted in English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Basic Numerical Methods
Module number	CMS-COR-NUM
Module coordinator	Prof. Dr. Ivo Sbalzarini ivo.sbalzarini@tu-dresden.de
Learning goals	Upon completion of the module, students will have mastered the fundamentals of numerical mathematics and numerical simulation methods. They will have a theoretical understanding of how a computer performs calculations using finite-precision floating-point numbers, the errors and inaccuracies that can arise in the process, and how to mitigate and control these. They will be familiar with fundamental numerical methods for solving and simulating mathematical models, models in linear algebra, and ordinary and partial differential equations. They will be able to estimate the approximation errors of these methods and determine their computational complexity, and will be capable of implementing the methods themselves, adapting them to specific applications, and optimizing them.
Contents	The module covers floating-point arithmetic, rounding errors, cancellation, numerical interpolation using the Lagrange, Newton, Aitken-Neville, Hermite, and spline methods, numerical solution of linear and nonlinear equations and systems of equations, Taylor series expansions, finite differences and their approximation errors, explicit and implicit time integrators, numerical stability, direct and iterative algorithms for matrix inversion, numerical integration, discrete Fourier transforms, matrix decomposition, solvers for the Poisson equation, and fundamentals of numerical methods for partial differential equations.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both the lectures and the exercises is English.
Prerequisites	Knowledge of sequential computer programming, algorithms and data structures, analysis of functions of one and several variables, linear algebra, vector and matrix calculus, as well as probability theory and statistics at the bachelor’s level is required. The following literature is recommended for preparation: 1. Algorithmics - the spirit of computing. David Harel. Addison-Wesley, 2004, 2. C++ from the Ground Up. Herbert Schildt. McGraw-Hill, 2003, 3. Structure and Interpretation of Computer Programs. Hal Abelson, Gerald Jay Sussman. MIT Press, 1985, 4. Introduction to Algorithms, 2nd Edition. T. H. Cormen, C. E. Leiserson, R. L. Rivest. MIT Press, 2001, 5. Multivariable Calculus with Applications (Undergraduate Texts in Mathematics). Terrell Lax. Springer, 2018, 6. Linear Algebra. Jim Hefferon. http://joshua.smcvt.edu/linearalgebra/, 2008.

Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the core curriculum and must be selected in accordance with Appendix 1 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Stochastics and Probability
Module number	CMS-COR-SAP
Module coordinator	Prof. Dr. Ivo Sbalzarini ivo.sbalzarini@tu-dresden.de
Learning goals	Upon completion of the module, students will have mastered the fundamentals of stochastic modeling and simulation. They will be able to independently implement stochastic algorithms and formulate new ones.
Course Content	The module covers conditional probabilities, normal distributions and scale-free distributions, transformation of random variables, simulation of pseudo- and quasi-random numbers, Markov chains and their matrix representation, mixing times, Monte Carlo methods—in particular convergence, the law of large numbers, variance reduction, Rao-Blackwell, Importance sampling, Markov chain Monte Carlo using Metropolis-Hastings and Gibbs samplers, random processes and Brownian motion—in particular, properties in 1, 2, 3, and more dimensions—connection to the diffusion equation, stochastic differential equations—in particular, nonlinear transformations of Brownian motion, Ito calculus, Ornstein-Uhlenbeck process, and other solvable equations, numerical simulation of stochastic differential equations, in particular strong and weak error estimates, Euler-Maruyama scheme, Milstein scheme, stochastic optimization algorithms, and exact stochastic simulation algorithms for reaction networks.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Knowledge of sequential computer programming, algorithms and data structures, analysis of functions of one and several variables, linear algebra, vector and matrix calculus, as well as probability theory and statistics at the bachelor's level is required. The following literature is recommended for preparation: 1. Algorithmics - the spirit of computing. David Harel. Addison-Wesley, 2004, 2. C++ from the Ground Up. Herbert Schildt. McGraw-Hill, 2003, 3. Structure and Interpretation of Computer Programs. Hal Abelson, Gerald Jay Sussman. MIT Press, 1985, 4. Introduction to Algorithms, 2nd Edition. T. H. Cormen, C. E. Leiserson, R. L. Rivest. MIT Press, 2001, 5. Multivariable Calculus with Applications (Undergraduate Texts in Mathematics). Maria Shea Terrell, Peter D. Lax. Springer, 2018, 6. Linear Algebra. Jim Hefferon. http://joshua.smcvt.edu/linearalgebra/, 2008.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the core curriculum

	and must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Scientific Software Engineering
Module Number	CMS-COR-SSE
Module coordinator	Prof. Dr. Uwe Aßmann uwe.assmann@TU Dresden
Learning goals	Students will master fundamental methods, design elements, and notations for the systematic modeling, design, and development of large object-oriented software systems for scientific computing, with particular emphasis on the reuse of classes and frameworks, the use of design patterns, and the underlying principles of role-based modeling. They will be able to contribute to the design and development of large software systems in accordance with the current state of the art and apply these systems in practical scenarios.
Contents	The module covers classic design patterns in UML and programming languages for the variability, extensibility, and reuse of components and software frameworks.
Teaching and learning methods	The module includes lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	A basic understanding of computer programming at the bachelor's level is required, particularly the principles of object-oriented programming, programming in Java, C#, Python, and C++, and UML modeling—such as class diagrams, object diagrams, state diagrams, and sequence diagrams. The following literature is recommended for preparation: Design Patterns: Elements of Reusable Object-Oriented Software. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides. Addison Wesley, 1994.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module within the core technical curriculum and must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual test lasting 15 minutes . A bonus component to the oral examination is the completion of computer-based exercises totaling 15 hours. The language of the examination is English.

Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Computer Vision
Module number	CMS-TRK-CV
Module coordinator	Prof. Dr. Bjoern Andres bjoern.andres@tu-dresden.de
Learning goals	Students will become familiar with basic linear and nonlinear operators used in image analysis and will be able to implement and apply them independently. They will understand the problems of image classification, image segmentation, object detection, and object tracking in their mathematical formulations. They will be familiar with local search algorithms for these problems and will be able to implement them independently and apply them to image data. Students are familiar with and understand the mathematical concepts of artificial neural networks and convolutional networks. They are familiar with and understand the forward and backward propagation algorithms used in machine learning for deep artificial neural networks and are able to apply these algorithms to the problem of image classification. They can present subject-specific results in English.
Contents	The module covers color spaces, elementary linear and nonlinear operators in image analysis, the problem of image classification, artificial neural networks, convolutional networks, forward and backward propagation algorithms, image segmentation as an optimization problem, local search algorithms for image segmentation, object detection as an optimization problem, local search algorithms for object detection, object tracking as an optimization problem, and local search algorithms for object tracking.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	Knowledge of algorithms and data structures, the fundamentals of theoretical computer science, the analysis of univariate and multivariate functions, linear algebra, probability theory, and statistics at the bachelor's level is required. The following literature is recommended for preparation:

	1. Algorithms and Data Structures. Kurt Mehlhorn, Peter Sanders. Springer Berlin Heidelberg, 2008. ISBN: 978-3-540-77977-3. DOI: 10.1007/978-3-540-77978-0, 2. Analysis 1. Konrad Königsberger. Springer Berlin Heidelberg, 2004. ISBN: 978-3-540-40371-5. DOI: 10.1007/978-3-642-18490-1, 3. Analysis 2. Konrad Königsberger. Springer Berlin Heidelberg, 2013. ISBN: 978-3-662-05699-8. DOI: 10.1007/978-3-662-05699-8, 4. Linear Algebra. Gerd Fischer. Springer Spektrum Wiesbaden, 2014, ISBN: 978-3-658-03945-5. DOI 10.1007/978-3-658-03945-5, 5. Introduction to Probability Theory and Statistics. Ulrich Krengel. Vieweg+Teubner, Wiesbaden, 2013. ISBN: 978-3-322-93581-6. DOI: 10.1007/978-3-322-93581-6. 6. Theoretical Computer Science. Lutz Priese, Katrin Erk. Springer Vieweg Berlin Heidelberg, 2018. ISBN: 978-3-662-57408-9. DOI: 10.1007/978-3-662-57409-6.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Visual Computing track, the Computational Engineering track, the Applied Artificial Intelligence track, the Computational Mathematics track, the Computational Life Science track, and the Computational Environmental Science and Engineering track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Machine Learning
Module number	CMS-COR-ML
Module coordinator	Prof. Dr. Björn Andres bjoern.andres@tu-dresden.de
Learning goals	Students will be familiar with the problems of supervised, semi-supervised, unsupervised, and structural machine learning as formulated as mathematical optimization problems. They will understand the complexity of these problems and be able to prove this complexity themselves using methods from theoretical computer science. They are familiar with efficient local search algorithms for learning decision trees, logistic regression, correlation clustering, linear ordering, as well as for inference and learning in graphical models with factor graphs, and are able to implement and apply these algorithms themselves. Students are familiar with the structure of simple artificial neural networks as well as the forward and backward propagation algorithms, and are able to implement and apply these algorithms on their own. They can present research findings in English.
Contents	The module covers supervised machine learning as an optimization problem, regularized risk minimization, decision tree learning, logistic regression, neural networks, and the fundamentals of supervised deep learning, forward and backward propagation algorithms, semi-supervised and unsupervised machine learning as optimization problems, classification with more than two classes, correlation clustering, linear ordering, structural machine learning as an optimization problem, graphical models, factor graphs, the Gibbs distribution, and message-passing algorithms.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both the lectures and the exercises is English.
Prerequisites	Prerequisites include proficiency in algorithms and data structures, the fundamentals of theoretical computer science, the analysis of univariate and multivariate functions, linear algebra, probability theory, and statistics at the bachelor's level. The following literature is recommended for preparation: 1. Algorithms and Data Structures. Kurt Mehlhorn, Peter Sanders. Springer Berlin Heidelberg, 2008. ISBN: 978-3-540-77977-3. DOI: 10.1007/978-3-540-77978-0, 2. Analysis 1, Konrad Königsberger. Springer Berlin Heidelberg, 2004. ISBN: 978-3-540-40371-5. DOI: 10.1007/978-3-642-18490-1, 3. Analysis 2, Konrad Königsberger. Springer Berlin Heidelberg, 2013. ISBN: 978-3-662-05699-8. DOI: 10.1007/978-3-662-05699-8, 4. Linear Algebra, Gerd Fischer. Springer Spektrum Wiesbaden, 2014. ISBN: 978-3-658-03945-5. DOI 10.1007/978-3-658-03945-5,

	5. Introduction to Probability Theory and Statistics, Ulrich Krengel. Vieweg+Teubner, Wiesbaden, 2013. ISBN: 978-3-322-93581-6. DOI: 10.1007/978-3-322-93581-6, 6. Theoretical Computer Science, Lutz Priese, Katrin Erk. Springer Vieweg Berlin Heidelberg, 2018. ISBN: 978-3-662-57408-9. DOI: 10.1007/978-3-662-57409-6.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module within the core curriculum and must be selected in accordance with Appendix 1 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.
Recommended Reading	1. Machine Learning: A Probabilistic Perspective. Kevin P. Murphy. MIT Press, 2012. ISBN: 978-0262018029, 2. An Introduction to Statistical Learning. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Jonathan Taylor. Springer, 2023. ISBN: 978-3031387463, 3. *Mathematics for Machine Learning*. Marc Peter Deisenroth. Cambridge University Press, 2020. ISBN: 978-1108455145.

Module name	Machine Learning in Signal Processing
Module Number	CMS-TRK-MLSP
Module coordinator	Prof. Dr. Fettweis Gerhard.Fettweis@tu-dresden.de
Learning goals	Students will gain an overview of fundamental machine learning methods and their application in signal processing, with a particular focus on the estimation-theoretic foundations of learning algorithms. Students will understand the design principles of machine learning algorithms and the fundamental trade-off between the flexibility of a machine learning model and its generalization ability. They will be familiar with methods of signal preprocessing and signal representation for applying machine learning to signal processing problems.
Contents	The module covers fundamental methods for regression and classification, such as linear regression, logistic regression, and the k-nearest-neighbor algorithm, as well as their foundations in estimation theory, the trade-off between a model's flexibility and its generalization ability, characteristics of learning in high-dimensional spaces compared to learning in low-dimensional spaces, increasing the flexibility of linear models using polynomials and splines, wavelets for structured signal representation, key concepts of convex optimization, support vector machines, and the fundamentals of neural networks.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 1 SWS, lab sessions totaling 1 SWS, and self-study. The language of instruction for the lectures, exercises, and lab sessions is English.
Prerequisites	Basic proficiency in probability theory and linear algebra at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a 120-minute written exam and an ungraded portfolio requiring 15 hours of work. The language of the examination is English in both cases.

Credits and Grades	A total of 5 credit points can be earned through this module. The module grade is calculated based on the unweighted average of the grades for the individual examination components, in accordance with Section 15, Paragraph 1, Sentence 6 of the General Examination Regulations.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Advanced Problem Solving and Search
Module number	CMS-TRK-APSS
Module coordinator	Dr. Sarah Alice Gaggl sarah.gaggl@tu-dresden.de
Learning goals	Students will become familiar with scientific methods for addressing complex combinatorial and search problems relevant to applications in computer science. They will understand the formal modeling of these problems and be familiar with methods for solving them. They will be able to formally analyze the computational properties of these problems and associated algorithms.
Course Content	The module covers uninformed and informed search, local search, stochastic hill climbing, simulated annealing, tabu search, constraint satisfaction problems, evolutionary and genetic algorithms, answer set programming, and structural decomposition techniques such as tree and hypertree decompositions.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Knowledge of the fundamentals of algorithm design, formal languages, theoretical computer science, and propositional and predicate logic, as well as mathematics at the bachelor's level, is required.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Modeling in Energy Economics track, the Applied Artificial Intelligence track, the Computational Engineering track, and the Computational Life Science track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Conversational Artificial Intelligence
Module number	CMS-TRK-CAI
Module coordinator	Hon. Prof. Dr. Jens Lehmann jens.lehmann@tu-dresden.de
Learning goals	Students will be able to independently acquire knowledge of methods in the field of Conversational Artificial Intelligence from the literature and present this knowledge in English.
Contents	The module covers methods in the field of dialogue-based artificial intelligence.
Teaching and learning methods	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Visual Computing track and the Applied Artificial Intelligence track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 50 hours. The language of the examination is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Foundations of Computer Graphics
Module Number	CMS-TRK-FCG
Module coordinator	Prof. Dr. Stefan Gumhold stefan.gumhold@tu-dresden.de
Learning goals	Students will be familiar with the components of a graphics application and will be able to design new graphics applications based on specific requirements. They will be able to apply and analyze the fundamentals of computer graphics in solving graphics-related problems. They will have an overview of the subfields of modeling, rendering, and animation, and will be able to establish connections between these areas and address interdisciplinary problems. In addition, they can propose suitable geometric representations for a given problem and can describe, implement, and analyze fundamental algorithms of geometric modeling. You are familiar with the stages of the rendering pipeline and can describe the underlying techniques. You can explain the concept of ray tracing and have a detailed understanding of how to implement a ray tracer. You are familiar with basic animation techniques, can explain the mathematical principles behind them, and describe how to enhance a graphics application with animations.
Contents	The module covers working with vectors and transformations, color perception and color spaces, as well as the architecture of graphics systems; modeling, such as parametric curves and surfaces; basic modeling techniques and polygonal meshes; and visualization using the rendering pipeline, basic lighting calculations, texturing, and the ray tracing method. Additional content related to animation includes approaches based on keyframes, particle systems, and morphing, as well as the fundamentals of using acceleration data structures.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	A bachelor's-level understanding of vector spaces and matrices, as well as imperative programming, is required.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Applied Artificial Intelligence track, the Visual Computing track, the Computational Engineering track, and the Computational Life Science track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling , and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."

Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. Completing 15 hours of practice exercises counts as a bonus toward the written exam. The exam is conducted in English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.
Recommended Reading	Fundamentals of Computer Graphics. P. Shirley, M. Ashikhmin, S. Marschner. AK Peters/CRC Press, 2009.

Module name	High-Performance Computing
Module Number	CMS-COR-HPC
Module coordinator	Prof. Dr. Wolfgang Nagel wolfgang.nagel@tu-dresden.de
Learning goals	Students will be able to describe strategies and methods of parallel processing in parallel computer architectures. They will be able to evaluate parallel architectures and network concepts and assess their suitability for various parallel algorithms. They will be able to develop simple parallel programs that utilize different types of parallelism.
Course Content	The module covers the fundamentals of high-performance computing and its programming, as well as strategies and methods of parallel processing, including programming models widely used in supercomputing. Additional content includes architecture and network concepts, as well as the necessary algorithmic building blocks, closely linked to practical experience from the interdisciplinary field of work at the CIDS Department ZIH—Information Services and high-performance computing.
Teaching and Learning Formats	The module comprises lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Students are expected to have bachelor's-level proficiency in setting up computer systems, as well as basic skills in using a Unix command-line environment and the C programming language. The following literature is recommended for preparation: 1. *Introduction to High-Performance Computing for Scientists and Engineers*, G. Hager, G. Wellein. CRC Press, 2010. *https://www.taylorfrancis.com/books/9780429190612*, 2. Computer Architecture, Fifth Edition: A Quantitative Approach, John L. Hennessy, David A. Patterson. Morgan Kaufmann Publishers Inc., 2011. https://dl.acm.org/doi/book/10.5555/1999263, 3. Programming: Principles and Practice Using C++, Bjarne Stroustrup. Addison-Wesley Professional, 2014, https://learning.oreilly.com/library/view/-/9780133796759/?ar, 4. The Linux Command Line, 2nd Ed., W.E. Shotts. No Starch Press, 2019. https://learning.oreilly.com/library/view/-/9781492071235/?ar.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module within the foundational specialized training, which must be selected in accordance with Appendix 1 of the Specific Examination Regulations . This module cannot be selected in the Master's program in Computational

	Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under “Prerequisites.”
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam is conducted in English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Data Visualization
Module number	CMS-COR-VIZ
Module coordinator	Prof. Dr. Stefan Gumhold
Learning goals	Students will master the fundamentals and practices of scientific visualization of measurement and experimental data as well as simulation results. They will understand the fundamentals of visual perception and its influence on the design of visualizations. Students will be able to confidently specify data by dimension, feature types, and structure, and select appropriate visual attributes for a given specification. They are familiar with the most important forms of visualization for two-, three-, and multidimensional observation spaces, as well as for scalar, vector, tensor, and multidimensional feature values. They are able to select appropriate techniques for the respective visualization task. Students are familiar with basic presentation and interaction techniques and can implement them at a fundamental level in an interactive visual analysis system. They are familiar with the most important visualization frameworks, have gained practical experience with them, and are able to select them appropriately for the task at hand.
Contents	The module covers the fundamentals of data visualization, focusing on the representation of different types of data as visual attributes and insights into human visual perception.
Teaching and learning methods	The module consists of 2 SWS of lectures, 2 SWS of exercises, and self-study. The language of instruction for both the lectures and the exercises is English.
Prerequisites	Knowledge of sequential computer programming, algorithms and data structures, analysis of functions of one and more variables, basic techniques of data analysis, and linear algebra—particularly vector and matrix calculus—at the bachelor's level is required. The following literature is recommended for preparation: 1. Algorithmics - the spirit of computing. David Harel. Addison-Wesley, 2004, 2. C++ from the Ground Up. Herbert Schildt. McGraw-Hill, 2003, 3. Structure and Interpretation of Computer Programs, Hal Abelson, Gerald Jay Sussman. MIT Press, 1985, 4. Introduction to Algorithms, 2nd Edition. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein. MIT Press, 2001, 5. Multivariable Calculus with Applications (Undergraduate Texts in Mathematics). Peter D. Lax, Maria Shea Terrell, Springer, 2018, 6. Linear Algebra. Jim Hefferon. http://joshua.smcvt.edu/linearalgebra, 2008.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the core curriculum and must be selected in accordance with Appendix 1 of the Specific

	Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Digitization and Data Analytics
Module number	CMS-TRK-DDA
Module coordinator	Prof. Dr. Wolfgang Nagel wolfgang.nagel@tu-dresden.de
Learning goals	Students will understand various concepts related to data storage and metadata collection and will be able to develop data management strategies for existing datasets. Students will be familiar with and understand various methods of data preprocessing, exploratory data analysis, and machine learning; they will be able to assess the strengths and weaknesses of these methods in relation to given data and apply them using current software frameworks both locally and on an HPC infrastructure.
Course Content	The module covers current approaches to analyzing large data sets (big data) for specific computer architectures, as well as processing in the context of high-performance computing (HPC); various data analytics approaches and their application in the HPC environment. Additional topics include data analytics frameworks, fundamentals of statistical analysis, machine learning methods, and selected applications.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Basic knowledge of statistics and linear algebra at the bachelor's level, as well as a foundation in the use of Python, is required. The following literature is recommended for preparation: 1. Mathematics for Engineers II: Calculus and Linear Algebra. G. Baumann. Oldenbourg Verlag, 2010. http://dx.doi.org/10.1524/9783486598476, 2. All of Statistics. L. Wasserman. Springer. 2004. https://link.springer.com/book/10.1007/978-0-387-21736-9, 3. Python for Data Analysis, 3rd ed. W. McKinney. O'Reilly Media, 2022. https://learning.oreilly.com/library/view/-/9781098104023/?ar.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Visual Computing track, the Computational Engineering track, the Computational Life Science track, and the Applied Artificial Intelligence track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."

Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam is conducted in English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Adaptive Laser Systems
Module number	CMS-TRK-AL
Module coordinator	Prof. Dr. Jürgen Czarske juergen.czarske@tu-dresden.de
Learning goals	Upon completion of the module, students will be able to describe and evaluate the physical principles and technical design of adaptive laser sensors. They will have mastered the fundamental approaches and methods of system design for modern laser sensors.
Contents	The module covers laser measurement technology, including fundamental principles of physics and electrical engineering such as Gaussian beams, interferometry, ultrashort-pulse lasers, Fourier optics, and fiber-optic sensing, as well as the practical implementation and application of adaptive laser sensors in fields such as biophotonics, medical technology, optical information technology, and energy technology.
Teaching and Learning Formats	The module includes lectures totaling 2 SWS, exercises totaling 1 SWS, lab sessions totaling 1 SWS, and self-study. The language of instruction for the lectures, exercises, and lab sessions is English.
Prerequisites	Knowledge of physics at the advanced-level Abitur course level, as well as knowledge of systems theory and the fundamentals of optics and photonics at the bachelor's level, is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination as an individual exam lasting 20 minutes and a portfolio representing 20 hours of work. Both components are required for passing. The language of the examination is English in both cases.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade is calculated as the weighted average of the grades for the individual assessment components. The oral exam is weighted three times, and the portfolio is weighted once.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.

Duration of the module	The module spans 1 semester.

Module name	Circuit and System Design
Module number	CMS-TRK-CSD
Module coordinator	Prof. Dr. Christian Georg Mayr christian.mayr@TU Dresden.de
Learning goals	Students will be able to systematically develop the data path (register-transfer description) and the control logic (FSM) of a numerically-based algorithm of their own choosing using a data dependency graph. They are familiar with the implementation workflow, which includes both the automated synthesis of complex blocks based on a hardware description language—such as Verilog—and manually optimized digital data path elements.
Contents	The module covers the fundamentals and methods for developing application-specific digital integrated circuits (ASICs). This includes the conversion of a numerical algorithm into a data dependency graph, the application of scheduling and allocation methods, optimization with regard to resource consumption—such as area and runtime—as well as the implementation, functional verification, and simulation of the ASIC.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 1 SWS, projects totaling 2 SWS, and self-study. The language of instruction for the lectures, exercises, and projects may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Basic knowledge of systems theory—for example, filter design, algebra, differential equations, and function theory at the bachelor's level—as well as the competencies to be acquired in the CMS-TRK-DCD Digital Circuit Design module are required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 40 hours. The language of the examination is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.

Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Deep Neural Network Hardware
Module Number	CMS-TRK-DNNH
Module coordinator	Prof. Dr. Christian Georg Mayr christian.mayr@TU Dresden.de
Learning goals	Students will gain a solid understanding of the key design decisions involved in DNN accelerators. They will be able to select or design an accelerator for a given application. They will know and understand the necessary steps for running deep neural networks (DNNs) on hardware accelerators, as well as common optimization methods for DNN accelerators.
Course Content	The module covers the design of hardware accelerators for deep neural networks (DNNs)—from architectures to arithmetic building blocks—hardware and software co-designs for DNN accelerators, the necessary steps for executing DNNs on hardware accelerators, as well as current optimization methods and novel approaches for DNN accelerators.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	No prior knowledge is required.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Virtual Reality
Module number	CMS-TRK-VR
Module coordinator	Prof. Dr. Ercan Altinsoy ercan.altinsoy@TU Dresden.de
Learning goals	Students will gain knowledge and understanding of the technological foundations, basic principles, and technical terminology of virtual reality, particularly the design and functioning of virtual environments and the integration of virtual reality and artificial intelligence. They will be able to design acoustic, haptic, and visual sensors, actuators, and systems, and will be familiar with the development and application of VR systems in education, industry, telesurgery, teletherapy, and nursing. Students will be able to identify and understand problems in this field of application and develop solutions.
Contents	The module covers selected techniques, methods, and current technologies used in virtual reality, the role of AI in virtual reality, audio recording and playback technologies—in particular, binaural technology, stereophony, ambisonics, wavefield synthesis, and the implementation of room acoustic models—as well as sound synthesis methods, haptic devices, haptic perception, and visual output devices—in particular, VR headsets, head-mounted displays, and cave environments.
Teaching and Learning Formats	The module includes lectures totaling 2 SWS, projects totaling 20 hours, and self-study. The language of instruction for the lectures and projects is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Applied Artificial Intelligence track and the Computational Life Science track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 20 hours. The language of the examination is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts one semester.

Module name	Hardware-Software Co-Design
Module Number	CMS-TRK-HWSWC
Module coordinator	Prof. Dr. Fettweis Gerhard.Fettweis@tu-dresden.de
Learning goals	Students will gain an overview of current hardware architectures, particularly various hardware platforms for the software implementation of digital signal processing algorithms, and will be able to evaluate these platforms based on various criteria, such as flexibility and power consumption. Students can derive hardware requirements from algorithms, taking into account flexibility requirements for both hardware and software components. They are familiar with strategies for improving performance and minimizing power consumption and can apply these confidently.
Contents	The module covers methods and various aspects of the hardware and software implementation of embedded systems, including those in communications engineering; the mutual influence of both design areas—that is, co-design—with a view to optimizing circuit design; and new parallel processing concepts resulting from massive scaling down toward the nanoscale.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	Basic knowledge of computer architectures and digital signal processing algorithms at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.

Duration of the module	The module spans 1 semester.

Module name	Applied Robotics and Control for Cooperative and Autonomous Mobility
Module number	CMS-TRK-ARCCAM
Module coordinator	Prof. Dr. Meng Wang meng.wang@TU Dresden.de
Learning goals	Students will be familiar with fundamental theories of robotics and control engineering and will be able to identify and explain basic phenomena in traffic systems with regard to inefficiencies, risks, and environmental impacts; describe the architecture and functionality of key components of autonomous driving systems; apply robotics and control theories to program and test mobile robots in a miniature laboratory, design and implement a controller in a mobile robot to solve a traffic problem, and evaluate the performance of a controller.
Course Content	The module covers experimental learning with mobile robots in a full-scale laboratory, focusing in particular on the fundamentals of traffic phenomena as they relate to traffic safety, traffic congestion, and emissions; the state of the art in autonomous driving systems; the architecture of autonomous driving systems; key components such as sensors, control systems, and communication technologies; examples of Cooperative Adaptive Cruise Control (CACC), as well as programming and testing robot systems in a Miniature Connected, Cooperative, and Automated Mobility Lab (MiniCCAM). Additional topics include the fundamentals of cooperative control theory, particularly the implementation of a controller in a multi-robot system, performance testing of controllers, and the documentation of performance tests and controller evaluations.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English. Participation in the module is limited to 15 students in accordance with § 6, paragraph 7 of the Study Regulations. Selection is made by lottery.
Prerequisites	Knowledge of programming in Python, control theory, and linear algebra at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."

Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 70 hours. The language of the examination is English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Robot Learning
Module number	CMS-TRK-RL
Module coordinator	Prof. Dr. Roberto Calandra roberto.calandra@TU Dresden.de
Learning goals	Students will acquire in-depth knowledge of machine learning methods in the field of robotics and will be able to independently apply these methods. They will be able to mathematically describe machine learning problems in robotics, implement algorithms to solve these problems on their own, and empirically and quantitatively evaluate the application of these algorithms in the context of specific applications.
Course Content	The module covers the fundamentals of classical control theory, machine learning methods in robotics—such as optimization, supervised learning for robotics, and reinforcement learning—as well as problems and applications of machine learning methods in robotics, including navigation, manipulation, locomotion, and multi-agent systems.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	No prior knowledge is required.
Availability	In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Applied Artificial Intelligence track and the Computational Life Science track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Scientific Visualization
Module Number	CMS-TRK-SciVis
Module coordinator	Prof. Dr. Stefan Gumhold stefan.gumhold@tu-dresden.de
Learning goals	Students will learn the fundamentals of stereo-based visualization, particle visualization, terrain visualization, and volume visualization. They will understand how various features are mapped to visual attributes. They are familiar with the necessary hardware, data structures, and algorithms. In particular, they are familiar with rendering approaches that enable the interactive visualization of large datasets. They know how hierarchical and batch-based structuring can be implemented.
Contents	The module covers the application areas of stereoscopy, particle visualization, terrain visualization, and volume visualization. The stereoscopy application area includes perception, display technology, and rendering, while the particle visualization application area covers datasets, glyph-based visualization, and efficient rendering algorithms. Additional content in the field of terrain visualization includes terrain models, data structures, and efficient rendering algorithms, while the field of volume visualization covers volume rendering integrals, lighting models, advanced transfer function design, and rendering algorithms for various volume representations. Additional topics covered in the module include topological methods, vector field visualization, and tensor field visualization.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Students are expected to have acquired the competencies covered in the modules CMS-TRK-FCG Foundations of Computer Graphics and CMS-COR-VIZ Data Visualization.
Availability	In the Computational Modeling and Simulation master’s program, this module is an elective compulsory module in the Applied Artificial Intelligence track, the Visual Computing track, the Computational Engineering track, and the Computational Life Science track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master’s program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under “Prerequisites.”
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. A bonus component

	to the written exam is the completion of 15 hours of practice exercises. The exam language is English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Computer- and Robot-Assisted Surgery
Module number	CMS-TRK-CRC
Module coordinator	Prof. Dr. Stefanie Speidel stefanie.speidel@nct-dresden.de
Learning goals	Students will master the methodological and practical fundamentals of computer- and robot-assisted surgery. They will be able to apply these methods, tackle new interdisciplinary tasks, select appropriate solutions, and develop new approaches.
Content	The module covers computer- and robot-assisted surgery. It includes the fundamentals of image acquisition, medical image processing and segmentation, registration, the basics of robotic and navigation systems, intraoperative assistance, and augmented reality, as well as insights into current research, clinical issues, and application examples.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Basic knowledge of the fundamentals of calculus, linear algebra (particularly vector and matrix algebra), and basic knowledge of computer programming at the bachelor's level is required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Visual Computing track, the Computational Engineering track, the Applied Artificial Intelligence track, and the Computational Life Science track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual exam lasting 30 minutes. The language of the examination is English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Sound Design
Module number	CMS-TRK-SD
Module coordinator	Prof. Dr. Ercan Altinsoy ercan.altinsoy@TU Dresden.de
Learning goals	Students will be familiar with and understand the technological foundations, basic principles, and technical terminology of sound design, particularly the design of sounds and noises, as well as generative AI tools for audio applications. They will be able to design acoustic signals, make environmental phenomena and events audible, convey messages, and elicit or amplify affective, cognitive, and/or psychomotor responses through acoustic signals. They are able to comprehend problems in acoustics and sound design and know how to develop solutions incorporating approaches from computer science. Students can lead and participate in interdisciplinary projects and teams.
Contents	The module covers methods of sound design, particularly the relationship between acoustic signals as carriers of information and the associated auditory perceptions, and, in this context, the examination of perceptual aspects of sounds.
Teaching and Learning Formats	The module includes lectures totaling 2 SWS, projects totaling 20 hours, and self-study. The language of instruction for the lectures and projects is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 20 hours. The language of the examination is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Computational Laser Systems
Module number	CMS-TRK-CLS
Module coordinator	Prof. Dr. Jürgen Czarske juergen.czarske@tu-dresden.de
Learning goals	Students will be able to apply their knowledge of laser physics, systems theory, digital signal processing, and Fourier optics to describe and design computer-aided optical imaging systems.
Course Content	The module covers digital holography and image processing, as well as biomedical laser systems and optogenetics. Topics include, among others, self-parameterization of laser systems, optogenetics through scattering tissue, neural networks for signal processing, adaptive optics, and diffractive deep neural networks for optical computing at the speed of light.
Teaching and Learning Formats	The module consists of lectures totaling 3 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of physics at the advanced-level Abitur course level, as well as knowledge of systems theory and the fundamentals of optics and photonics at the bachelor's level, is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual exam lasting 30 minutes. The language of the examination is either German or English, at the student's discretion.
Credits and Grades	Students can earn 5 credit points for this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Touch Sensing and Processing
Module number	CMS-TRK-TSP
Module coordinator	Prof. Dr. Roberto Calandra roberto.calandra@TU Dresden.de
Learning goals	Students will gain in-depth knowledge of touch-sensing and touch-processing techniques. They will be able to independently implement these techniques algorithmically. They will be able to apply these algorithms in practice, on specific touch-sensing hardware, and to specific problems, and will be able to empirically and quantitatively evaluate the algorithms in relation to their application.
Contents	The module covers the fundamentals of the psychology of the sense of touch, touch-sensing hardware, simulation of touch, touch sensing, touch processing, touch-based control, and applications of touch sensing, touch processing, and touch-based control.
Teaching and learning methods	The module consists of 2 SWS of lectures, 2 SWS of exercises, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	There are no prerequisites.
Availability	In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Visual Computing track, the Applied Artificial Intelligence track, and the Computational Engineering track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a portfolio equivalent to 10 hours of work. The language of the examination is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Team Assignment: Computational Metrology
Module Number	CMS-TRK-TEA-CM
Module coordinator	Prof. Dr. Jürgen Czarske juergen.czarske@tu-dresden.de
Learning goals	Students will be able to work on a complex research-oriented project that requires expertise from multiple areas of computer-based measurement technology, as well as to solve a larger, typically interdisciplinary problem in the field of computer-based measurement technology and intelligence as part of a group. Students will master literature research and the use of scientific information sources, and will possess both in-depth subject expertise and extensive methodological and interpersonal skills related to project management and teamwork.
Contents	The module covers the analysis and solution of a problem from the research field of computer-based measurement technology, for example, through physical or numerical experiments using deep neural networks to solve the inverse problem.
Teaching and learning methods	The module comprises projects totaling 8 SWS and self-study. The language of instruction for the projects is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 60 hours. The language of the examination is English.
Credit points and grades	Students can earn 10 credit points for this module. The module grade corresponds to the grade on the final exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 300 hours.
Duration of the module	The module lasts 1 semester.

Module name	Deep Learning for Vision - Foundations and Applications
Module number	CMS-TRK-DLVFA
Module coordinator	Prof. Dr. Martin Weigert martin.weigert@tu-dresden.de
Learning goals	Students will learn about deep learning architectures for computer vision and become familiar with scientific applications such as object recognition, tracking, and segmentation. They will be able to implement and train deep learning models in order to apply modern methods specifically to their own image processing problems.
Course Content	The module covers basic concepts of deep learning for image data, including fundamental architectures such as CNNs and ViTs, as well as training paradigms such as supervised and unsupervised learning. Additional topics include applications in various scientific disciplines and the practical implementation of these methods.
Teaching and Learning Formats	The module consists of 2 SWS of lectures, 2 SWS of exercises, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Basic knowledge of linear algebra, computer programming, and machine learning at the bachelor's level is required.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Life Science track, the Visual Computing track, and the Applied Artificial Intelligence track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Team Assignment: Machine Learning and Computer Vision
Module Number	CMS-TRK-TEA-MLCV
Module coordinator	Prof. Dr. Björn Andres bjoern.andres@tu-dresden.de
Learning goals	Students will be able to work on a complex, research-oriented project that requires expertise from multiple areas of applied artificial intelligence. Students will be able to work in a group to solve a larger, typically interdisciplinary problem in the field of applied artificial intelligence. They will master literature research and the use of scientific information sources and will possess both in-depth subject expertise and extensive methodological and interpersonal skills related to project management and teamwork.
Contents	The module covers the analysis of an optimization problem from the research areas of machine learning and computer vision; the definition and implementation of an algorithm for the exact or approximate solution of this problem; the analysis of this algorithm in terms of its complexity and approximation properties; and the quantitative empirical investigation of this algorithm as applied to concrete data.
Teaching and learning methods	The module includes projects totaling 8 SWS and independent study. The language of instruction for the projects is English.
Prerequisites	Students are expected to have bachelor's-level proficiency in algorithms and data structures, the fundamentals of theoretical computer science, the analysis of univariate and multivariate functions, linear algebra, probability theory, and statistics. The following literature is recommended for preparation: 1. Algorithms and Data Structures. Kurt Mehlhorn, Peter Sanders. Springer Berlin Heidelberg, 2008. ISBN: 978-3-540-77977-3. DOI: 10.1007/978-3-540-77978-0, 2. Analysis 1. Konrad Königsberger. Springer Berlin Heidelberg, 2004. ISBN: 978-3-540-40371-5. DOI: 10.1007/978-3-642-18490-1, 3. Analysis 2. Konrad Königsberger. Springer Berlin Heidelberg, 2013. ISBN: 978-3-662-05699-8. DOI: 10.1007/978-3-662-05699-8, 4. Linear Algebra. Gerd Fischer. Springer Spektrum Wiesbaden, 2014. ISBN: 978-3-658-03945-5. DOI 10.1007/978-3-658-03945-5, 5. Introduction to Probability Theory and Statistics. Ulrich Krengel. Vieweg+Teubner, Wiesbaden, 2013. ISBN: 978-3-322-93581-6. DOI: 10.1007/978-3-322-93581-6, 6. Theoretical Computer Science. Lutz Priese, Katrin Erk. Springer Vieweg Berlin Heidelberg, 2018. ISBN: 978-3-662-57408-9. DOI: 10.1007/978-3-662-57409-6.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial

	Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 60 hours. The language of the examination is English.
Credit points and grades	A total of 10 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 300 hours.
Duration of the module	The module lasts 1 semester.

Module name	Team Assignment: AI Hardware
Module Number	CMS-TRK-TEA-AIH
Module coordinator	Prof. Dr. Christian Georg Mayr christian.mayr@TU Dresden.de
Learning goals	Students will be able to work on a complex, research-oriented project that requires expertise from multiple areas of applied artificial intelligence, including hardware-software co-design. Students will be able to work in a group to solve a larger, typically interdisciplinary problem in the field of applied artificial intelligence, particularly the implementation of AI algorithms on a given accelerator architecture. They are proficient in conducting literature reviews and utilizing scientific information sources, and possess both in-depth subject-matter expertise and extensive methodological and interpersonal skills related to project management and teamwork.
Contents	The module covers the analysis of a practical problem from the field of machine learning, as well as the implementation of the algorithm on a given accelerator architecture. It also addresses the optimization of the algorithm for the accelerator—for example, with regard to structural and dynamic sparsity, data flow, or quantization—as well as the implementation and analysis of the optimization in terms of effectiveness and its impact on the problem and application.
Teaching and learning methods	The module comprises projects totaling 8 SWS and self-study. The language of instruction for the projects is English.
Prerequisites	Bachelor's-level proficiency in algorithms and data structures, linear algebra, accelerator architectures (e.g., from VL DNN hardware), and hardware-oriented (embedded) programming is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Applied Artificial Intelligence track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 60 hours. The language of the examination is English.
Credit points and grades	Students can earn 10 credit points for this module. The module grade corresponds to the grade on the final exam.
Module frequency	The module is offered every summer semester.

Workload	The total workload is 300 hours.
Duration of the module	The module spans 1 semester.

Module name	Computational Fluid Dynamics
Module number	CMS-TRK-CFD
Module coordinator	Prof. Dr. Jochen Fröhlich jochen.froehlich@tu-dresden.de
Learning goals	Students will master fundamental discretization methods for partial differential equations in fluid mechanics. They will be able to develop and apply these algorithms, analyze them with respect to key properties, and validate them using appropriate tests.
Course Content	The module covers the classification of differential equations, finite difference and finite volume algorithms, and the analysis of the numerical properties of these methods in terms of convergence, consistency, and stability. Additionally, the module covers solution methods for resulting systems of equations and selected applications.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Knowledge of the fundamentals of mathematics—particularly calculus—the fundamentals of numerical methods, and the fundamentals of fluid mechanics—particularly conservation equations and similarity parameters—at the bachelor's level is required.
Applicability	This module is a required module in the Computational Engineering track of the Master's program in Computational Modeling and Simulation. In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Computational Mathematics track and the Computational Life Science track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.
Recommended Reading	Street Computational Methods for Fluid Dynamics, 4th ed. Joel H. Ferziger, Milovan Perić, Robert L. Street. Springer, 2020.

Module name	Finite Element Methods—Theory, Implementation, and Applications
Module number	CMS-TRK-MA31
Module coordinator	Director of the Institute of Scientific Computing id.wir@TU Dresden.de
Learning goals	Students will gain a systematic understanding of the theory of the finite element method (FEM), particularly regarding convergence results. They will acquire knowledge of algorithmic issues and implementation aspects in finite element software and will have fundamental knowledge and experience in modeling application-oriented problems, for example in the fields of fluid mechanics and materials science. Students are able to independently analyze specific problems from the application areas covered in the course and solve them using appropriate FEM methods.
Contents	The module covers the theory and practice of the finite element method, particularly variational formulation, discretization, convergence, numerical implementation, and application.
Teaching and learning methods	The module consists of lectures totaling 3 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	A bachelor's-level understanding of the numerical solution of ordinary differential equations is required. The following reference is recommended for preparation: Numerical Mathematics. Hans-Jörg Roos, Hubert Schwetlick. Vieweg+Teubner, 1999.
Applicability	In the master's program in Computational Modeling and Simulation, this module is a required module in both the Computational Mathematics track and the Computational Engineering track. In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Modeling in Energy Economics track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam language is English.

Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Advanced Topics in Finite Element Analysis
Module number	CMS-TRK-AT
Module coordinator	Prof. Dr. Markus Kästner markus.kaestner@tu-dresden.de
Learning goals	Students will acquire in-depth knowledge and skills for the numerical solution of mechanical field problems, taking into account geometric and material nonlinearities.
Course Content	The module covers the fundamentals of algebraization and discretization of initial-boundary value problems, the finite element method (FEM) for the approximate solution of mechanical field problems, and the numerical properties of the method. The module also covers the FEM for dynamic and nonlinear mechanical problems, as well as advanced aspects and applications such as the modeling of discontinuities, adaptive discretizations, and multiscale modeling approaches.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Knowledge of linear algebra, numerical methods for differential equations, and engineering mechanics at the bachelor's level is required.
Applicability	This module is a required module in the Computational Engineering track of the Master's program in Computational Modeling and Simulation. This module is an elective compulsory module in the Computational Life Science track of the Master's program in Computational Modeling and Simulation, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Multi-Body Dynamics
Module number	CMS-TRK-MBD
Module coordinator	Prof. Dr. Michael Beitelschmidt michael.beitelschmidt@tu-dresden.de
Learning goals	Students will understand the method of multi-body system simulation in order to calculate large-scale motions of mechanical systems composed of rigid bodies in the time domain. Students will master the methodology for deriving the equations of motion for multi-body systems as well as their computational implementation for simple special cases. Students will be familiar with the various algorithms used in multi-body simulation that are employed in commercial software.
Contents	The module covers the kinematics and kinetics of rigid bodies, the description of joints and constraints, the algorithms for deriving the equations of motion, and solution methods.
Teaching and learning methods	The module consists of 2 SWS of lectures, 2 SWS of exercises, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Knowledge of engineering mechanics at the bachelor's level is required.
Applicability	This module is a required module in the Computational Engineering track of the Master's program in Computational Modeling and Simulation. This module is an elective compulsory module in the Computational Life Science track of the Master's program in Computational Modeling and Simulation, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Multifield Problems
Module number	CMS-TRK-MP
Module coordinator	Prof. Dr. Thomas Wallmersperger thomas.wallmersperger@tu-dresden.de
Learning goals	Students will master the fundamentals of analyzing and calculating multifunctional structures and structural elements, as well as the fundamental relationships underlying the mathematical description of mechanical, thermal, and electrical phenomena in deformable bodies. Students will be able to describe and calculate active structures.
Course Content	The module covers the behavior and formulations for various active materials, the calculation of exemplary applications of multifunctional structures, the fundamental equations of continuum mechanics and their extension to other physical phenomena, and the modeling of field problems that couple different physical phenomena.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	Knowledge of linear algebra, numerical methods for differential equations, and engineering mechanics at the bachelor's level is required.
Applicability	This module is a required module in the Computational Engineering track of the Master's program in Computational Modeling and Simulation. This module is an elective compulsory module in the Computational Life Science track of the Master's program in Computational Modeling and Simulation, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	User Interface Engineering
Module number	CMS-TRK-UI1
Module coordinator	Prof. Dr. Raimund Dachselt raimund.dachselt@tu-dresden.de
Learning goals	Students will become familiar with the requirements and techniques for developing innovative, natural user interfaces. In particular, they will master the techniques of scenario-based and user experience design. They will be able to apply the concepts and techniques for developing innovative user interfaces in practice.
Course Content	The module covers the development of innovative, more natural user interfaces—such as those based on gesture or eye tracking—and the associated requirements, development processes, and HCI techniques, with a focus on scenario-based design and user experience design. Additional content includes engineering-centered approaches as well as creative design phases. These phases involve the creation of sketches and early prototypes.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	Knowledge of human-computer interaction at the bachelor's level is required. The following literature is recommended for preparation: 1. Interaction Design: Beyond Human-Computer Interaction, 6th Edition. Yvonne Rogers, Helen Sharp, Jennifer Preece. John Wiley & Sons, 2023. ISBN: 978-1-119-90109-9, 2. Human-Computer Interaction, 3rd Edition. Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale. Pearson Prentice Hall, 2002. ISBN: 978-0-13-046109-4.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Visual Computing track, the Computational Life Science track, and the Computational Engineering track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a written exam lasting 90 minutes and a portfolio comprising 60 hours of work. Both components are required for passing. The language of the examination is English in both cases.

Credits and Grades	A total of 5 credit points can be earned through this module. The module grade is calculated as the weighted average of the grades for the individual assessment components. The written exam is weighted three times, and the portfolio is weighted twice.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	System Dynamics
Module number	CMS-TRK-SysDyn
Module coordinator	Prof. Dr. Michael Beitelschmidt michael.beitelschmidt@tu-dresden.de
Learning goals	Students will acquire fundamental knowledge of system dynamics and will be able to describe the dynamics of mechanical systems and systems in other physical domains, as well as calculate and identify their behavior.
Course Content	The module covers the fundamental methods of theoretical modeling and the description of systems in the time and frequency domains using Fourier and Laplace transforms; the transfer characteristics of systems using the input-output model; the state-space formulation of dynamic systems; time-discrete methods; and the fundamentals of linear state-space control.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	Knowledge of linear differential equations and linear algebra at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foundations of Systems Engineering
Module Number	CMS-TRK-SysEng
Module coordinator	Prof. Dr. Christof Fetzer christof.fetzer@tu-dresden.de
Learning goals	Students will be able to design distributed software platforms using modern hardware and software components. Students will understand the challenges that distributed systems pose in terms of programming and correct execution, will be able to evaluate these challenges, and will apply appropriate mechanisms.
Course Content	The module covers the design, construction, and operation of software platforms; current topics in distributed systems architecture, such as parallel computing on modern hardware; ensuring the composability and security of complex modules; testing methods for the fastest possible error detection; and the management of human resources to support collaboration.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	Basic knowledge in the areas of system architecture, modularization, and the structuring of complex systems at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Scientific Programming – Advanced Concepts
Module number	CMS-TRK-MA33
Module coordinator	Director of the Institute of Scientific Computing id.wir@TU Dresden.de
Learning goals	Students will gain a systematic understanding of aspects of software development for the efficient implementation of numerical algorithms. They will gain experience in evaluating, applying, and extending such software.
Course Content	The module covers aspects of software development, such as programming on high-performance computing systems, object-oriented programming, and template-based programming.
Teaching and learning methods	The module consists of lectures totaling 3 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English; the specific language will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Programming skills as well as modeling and simulation competencies at the bachelor's level are required. The following literature is recommended for preparation: Mathematical Modeling. Christof Eck, Harald Garcke, Peter Knabner. Springer, 2017.
Applicability	This module is a required module in the Computational Mathematics track of the Master's program in Computational Modeling and Simulation. In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Engineering track and in the Computational Modeling in Energy Economics track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Closed-Loop Control in Networked Control Systems
Module number	CMS-TRK-CLC
Module coordinator	Prof. Dr. Christoph Sommer christoph.sommer@tu-dresden.de
Learning goals	Students will become familiar with the concepts and specific designs of networked systems with control loops. They will be able to design such systems and evaluate their performance and characteristics.
Contents	The module covers concepts, specific implementations, and methods for evaluating networked systems with control loops.
Teaching and learning methods	The module consists of 2 SWS of lectures, 2 SWS of exercises, and self-study. The language of instruction for both the lectures and the exercises is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a public oral examination administered as an individual exam lasting 20 minutes. The language of the examination is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Electromechanical and Microelectromechanical Systems
Module number	CMS-TRK-EMS
Module coordinator	Prof. Dr.-Ing. habil. Uwe Marschner uwe.marschner@TU Dresden
Learning goals	Students will acquire fundamental methodological and practical knowledge for the effective design and clear analysis of the dynamic behavior of electromechanical, microelectromechanical, and electromagnetic systems, as well as for the function and modeling of reversible electromechanical transducers in sensors and actuators. They are familiar with parameter determination using finite element methods and are proficient in the methodology of combining these methods using virtual cross-section elements. Students are able to apply clear and intuitive analysis methods for electrical networks, develop a deeper physical understanding, design physically distinct subsystems as closed-loop systems, and simulate them using existing design software such as SPICE.
Contents	The module covers the description of coupled multiphysical subsystems in the form of a unified circuit-level representation and the simulation of their behavior. Additional content includes simple mechanical, magnetic, fluidic, acoustic, electrical, and coupled systems, including their interactions, as well as the solution of complex problems involving design-oriented optimization of the dynamic behavior of electromechanical systems through the combination of network simulation of electromechanical systems with the finite element modeling method, as well as finite element and LTSPICE simulation tools.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	Basic knowledge of mathematics—calculations with complex numbers—as well as electrical engineering and physics—engineering mechanics, magnetism, pneumatics, and hydraulics—at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."

Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a 120-minute written exam and a portfolio requiring 12 hours of work. Both components are required for passing. The language of the examination is English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade is calculated as the weighted average of the grades for the individual assessment components. The written exam is weighted five times, and the portfolio is weighted once.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Advanced User Interfaces
Module number	CMS-TRK-UI2
Module coordinator	Prof. Dr. Raimund Dachselt raimund.dachselt@tu-dresden.de
Learning goals	Students will acquire knowledge of fundamental hardware technologies, tracking methods, interaction principles, implementation options, and application examples for natural user interfaces. They will be able to conduct scientific research in the promising field of human-computer interaction. Students will be able to critically analyze the latest and most influential articles in the topics covered.
Contents	The module covers the development of so-called post-WIMP or natural user interfaces, which are based on real-world experiences. The focus is on gestural and tactile application control, interactive interfaces, and mixed-reality environments. Additional content includes technologies and interaction principles for various input modalities, including multitouch, freehand gestures, pen interaction, and eye tracking, each in relation to international research.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, seminars totaling 2 SWS, and self-study. The language of instruction for both lectures and seminars is English.
Prerequisites	Students are expected to have acquired the competencies covered in the CMS-TRK-UI1 User Interface Engineering module.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Visual Computing track, the Computational Life Science track, and the Computational Engineering track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a 90-minute written exam and a portfolio representing 60 hours of work. Both components are required for passing. The language of the examination is English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade is calculated as the weighted average of the grades for the individual assessment components. The written exam is weighted three times, and the portfolio is weighted twice.
Module frequency	The module is offered every summer semester.

Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Interactive Information Visualization
Module number	CMS-TRK-IIV
Module coordinator	Prof. Dr. Raimund Dachselt raimund.dachselt@tu-dresden.de
Learning goals	Students will acquire practical knowledge in the field of interactive information and data visualization and master key techniques and fundamental principles related to modern computer environments. They will be able to evaluate existing information visualization solutions and select or develop appropriate visualization and interaction techniques tailored to specific tasks and users. Students can apply modern information visualization techniques and implement various concrete interactive visualization techniques in accordance with the current state of research.
Contents	The module covers advanced techniques in information visualization and key concepts in the interactive visualization of multivariate data, as well as networks and hierarchies. The focus is on concepts for exploring and analyzing large data and information spaces, coordinated visualization views, zoomable user interfaces, focus-and-context techniques, and magic lenses. Additional topics include modern visualization environments with very large and very small displays—as well as combinations thereof—mobile devices, immersive mixed-reality solutions, and physical data representations.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Students are expected to have acquired the foundational skills in data visualization covered in the CMS-COR-VIZ Data Visualization module. Additionally, knowledge of human-computer interaction at the bachelor's level is required. The following literature is recommended for preparation: 1. Interaction Design: Beyond Human-Computer Interaction, 6th Edition. Yvonne Rogers, Helen Sharp, Jennifer Preece. John Wiley & Sons, 2023. ISBN: 978-1-119-90109-9, 2. Human-Computer Interaction, 3rd Edition. Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russel Beale. Pearson Prentice Hall, 2002. ISBN: 978-0-13-046109-4.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Visual Computing track, the Computational Life Science track, and the Computational Engineering track. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam is conducted in English.

Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Particle Methods
Module number	CMS-TRK-PM
Module coordinator	Prof. Dr. Ivo Sbalzarini ivo.sbalzarini@tu-dresden.de
Learning goals	Students will master the fundamentals of the particle methods algorithm class. They will be able to independently implement and use particle methods for simulations of both discrete and continuous models. They will understand the mathematical and numerical foundations of particle methods and will be able to implement them in computer programs using efficient data structures.
Contents	The module covers particle methods for discrete systems, particle methods for continuous systems, time integration methods for particle methods, efficient data structures for particle methods, efficient neighborhood searches, discretization of differential operators using particles, and hybrid particle-grid methods.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Programming skills in a computer language such as Python, knowledge of analysis and vector calculus at the bachelor's level, and knowledge of physics at the advanced-level Abitur exam level are required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Computational Life Science track and the Computational Engineering track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Introduction to Computational Aerodynamics
Module number	CMS-TRK- Aero
Module coordinator	Prof. Dr. Sabine Roller sabine.roller@TU Dresden.de
Learning goals	Students have a basic understanding of fluid mechanics and aerodynamics as they apply to external flow, such as around airfoils. Students are familiar with basic numerical methods for simulating compressible flows and the limitations of their applicability—for example, panel methods—as well as the fundamentals of numerical discretization for three-dimensional external flow, such as the finite-volume method coupled with approximate Riemann solvers. Students possess a fundamental understanding of parallel computing architectures and the implementation of numerical solvers for PDEs on these architectures.
Contents	The module covers the fundamentals of fluid mechanics and aerodynamics, numerical methods for solving the equations involved, and the implementation of these methods on systems using high-performance computing.
Teaching and learning methods	The module consists of lectures totaling 3 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	No prior knowledge is required.
Applicability	In the Master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Computational Engineering track and the Computational Life Science track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Practical Aspects of Simulation
Module number	CMS-TRK-Sim
Module coordinator	Prof. Dr. Michael Beitelschmidt michael.beitelschmidt@tu-dresden.de
Learning goals	Students will learn the fundamentals of coupled simulation of systems across multiple physical domains as well as real-time simulation. Furthermore, students will be able to use a commercial MKS simulation program, specifically to independently create models, perform simulation calculations, and analyze and interpret results.
Contents	The module covers the modeling of systems across multiple physical domains. In particular, the concept of flow and difference variables, the fundamentals of numerical time-step integration of systems of ordinary differential equations and systems of differential-algebraic equations, key aspects of real-time simulation of systems, the modeling of multibody systems using a commercial simulation tool, and the use of the simulation tool through the independent development of models, their simulation, and the interpretation of results.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, lab sessions totaling 2 SWS, and self-study. The language of instruction for the lectures and lab sessions is English.
Prerequisites	Knowledge of systems of differential equations and the modeling of physical systems at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Computational Environmental Science Team Project
Module number	CMS-TRK-TEA-CES
Module coordinator	Prof. Dr. Niels Schütze niels.schuetze@tu-dresden.de
Learning goals	Students are able to work on a complex, research-oriented project that requires expertise in several areas of environmental science. Students are able to work in a group of 2 to 4 people to solve a larger, typically interdisciplinary problem in the field of environmental sciences. They are proficient in literature research and the use of scientific information sources, and possess in-depth subject expertise as well as extensive methodological and interpersonal skills related to project management and teamwork.
Contents	The module covers the interdisciplinary analysis, application, and communication of a topic of the student's choice from the fields of environmental sensors, environmental data analysis, remote sensing, numerical and algorithmic methods for modeling in environmental engineering and environmental natural sciences, computer science methods for data processing and conducting simulations, environmental data visualization, decision support, or machine learning.
Teaching and learning methods	The module comprises projects totaling 180 hours and self-study. The language of instruction for the projects may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	No prior knowledge is required.
Applicability	This module is a required module in the Computational Environmental Science and Engineering track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a comprehensive assignment totaling 70 hours. The exam is conducted in English.
Credits and Grades	A total of 10 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 300 hours.
Duration of the module	The module lasts 1 semester.

Module name	Computational Environmental Applications
Module number	CMS-TRK-EA
Module coordinator	Prof. Dr. Niels Schütze niels.schuetze@tu-dresden.de
Learning goals	Students will gain a thorough overview of current research topics and developments in environmental informatics. They will be able to independently deepen their knowledge in this field, as well as analyze and contextualize complex problems. They will be able to adapt interdisciplinary content to specific target audiences, present it orally in a structured manner, and participate competently in expert discussions.
Content	The module covers current topics and ongoing research in environmental informatics based on academic articles, readings, and discussions.
Teaching and learning methods	The module consists of seminars totaling 4 SWS and self-study. The language of instruction for the seminars may be German or English; it will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	No prior knowledge is required.
Applicability	This module is a required module in the Computational Environmental Science and Engineering track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a portfolio requiring 30 hours of work. The student may choose to take the exam in either German or English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts one semester.

Module name	Computational Statistics
Module Number	CMS-TRK-ED4
Module coordinator	Dr. Thomas Petzoldt thomas.petzoldt@tu-dresden.de
Learning goals	Students will be able to select statistical methods in a problem-oriented manner, apply them interactively using the R scripting language, and interpret the results responsibly.
Course Content	The module covers the fundamentals of data structuring, probability distributions, parameter estimation, confidence intervals, hypothesis testing, statistical modeling and model selection, linear and nonlinear models, analysis of variance, and time series analysis.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of the fundamentals of engineering mathematics—particularly systems of linear equations, differential and integral calculus, and probability theory—as well as active computer skills, especially in spreadsheet software, and basic knowledge of a programming environment at the bachelor's level are required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Geodata Infrastructures
Module number	CMS-TRK-ED5
Module coordinator	Prof. Dr. Lars Bernard lars.bernard@TU Dresden.de
Learning goals	Students will gain a thorough overview of geodata infrastructures (GDI) and related technologies. They will acquire the methodological skills needed to develop geoinformation services and to use and customize relevant software products.
Content	The module covers organizational and technical concepts of GDI, interoperability for geoinformation, and the development of GDI based on interoperable geoinformation services.
Teaching and Learning Formats	The module consists of 2 SWS of lectures, 2 SWS of exercises, and self-study. The language of instruction for the lectures and exercises may be German or English; the specific language will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Basic knowledge of geoinformatics at the bachelor's level is required, particularly regarding geodata structures, geodatabases, analysis of geo-objects, GIS, software modeling and design, and programming.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 40 hours. The language of the examination is either German or English, at the student's discretion.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Statistical Learning for Earth System Sciences
Module number	CMS-TRK-ED1
Module coordinator	Prof. Dr. Jakob Zscheischler jakob.zscheischler@tu-dresden.de
Learning goals	Students will be familiar with the fundamental concepts of statistical learning. They will be able to explain and apply the differences between various approaches to statistical learning. Furthermore, they will be able to implement these concepts in the R programming language and apply them to new problems.
Course Content	The module covers the fundamental concepts of statistical learning, including regression, classification, dimensionality reduction, the trade-off between bias and variance, and multiple testing. Additional content includes discussion and in-depth exploration of the concepts presented, as well as their application to data examples from Earth system sciences.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English; the specific language will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of mathematics, statistics, and probability theory at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a term paper requiring 30 hours of work. The language of the examination is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Image Analysis and Machine Learning in Environmental Remote Sensing
Module number	CMS-TRK-ED2
Module coordinator	Prof. Dr. Matthias Forkel matthias.forkel@tu-dresden.de
Learning goals	Students will become familiar with methods of multivariate analysis of optical and microwave remote sensing data for land cover mapping. They will be able to describe, apply, and critically evaluate methods of image analysis, unsupervised and supervised classification, machine learning, and deep learning, as well as use and adapt the corresponding programming languages and software packages.
Course Content	The module covers the processing and correction of multispectral and radar satellite data, filtering, image transformation, feature reduction, and texture analysis for feature extraction and selection, as well as machine learning methods and deep neural networks for land cover classification using supervised and unsupervised approaches, along with accuracy analysis.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Basic knowledge of remote sensing and the analysis of satellite images, proficiency in a script-based programming language at the bachelor's level, and the competencies to be acquired in the module CMS-TRK-ES4 " , Environmental, and Climate Remote Sensing" ( ) are required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual exam lasting 20 minutes . The language of the examination may be either German or English, at the student's discretion.

Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Retrieval of Land Surface Properties from Optical and Microwave Remote Sensing
Module number	CMS-TRK-ED6
Module coordinator	Prof. Dr. Matthias Forkel matthias.forkel@tu-dresden.de
Learning goals	Students will become familiar with methods and current developments for deriving biophysical land surface properties. They will be able to describe, apply, and critically evaluate empirical and physical derivation methods.
Course Content	The module covers methods for deriving land surface properties such as leaf area index, chlorophyll content, leaf and vegetation water content, biomass, and soil moisture using empirical and physics-based modeling approaches, optical and microwave-based vegetation radiative transfer models, model inversion using regression and optimization methods, as well as the selection and definition of cost functions.
Teaching and Learning Formats	The module consists of seminars totaling 2 SWS and self-study. The language of instruction for the seminars may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Basic knowledge of remote sensing and the analysis of satellite images, experience with a script-based programming language at the bachelor's level, and the competencies to be acquired in the module CMS-TRK-ES4 Environmental and Climate Remote Sensing are required.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 80 hours. The language of the examination may be either German or English, at the student's discretion.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.

Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Applied Remote Sensing for Environmental Research
Module number	CMS-TRK-ED3
Module coordinator	Prof. Dr. Matthias Forkel matthias.forkel@tu-dresden.de
Learning goals	Students will be able to independently conduct an environmental science research project using remote sensing data and methods and present the results to a specialist audience.
Course Content	The module covers the planning, implementation, and presentation of a remote sensing-based environmental research project; methods for processing and correcting optical and radar-based remote sensing data; techniques for time-series and change analysis, image analysis, machine learning, and the inversion of radiative transfer models; thematic applications in forestry and hydrology, ecology, forest fire and climate research, and the use of reference management and version control systems.
Teaching and Learning Formats	The module consists of seminars totaling 1 SWS and self-study. The language of instruction for the seminars may be German or English; this will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of a script-based programming language at the bachelor's level is required, as well as the competencies to be acquired in the modules CMS-TRK-ES4 Environmental and Climate Remote Sensing, CMS-TRK-ED2 Image Analysis and Machine Learning in Environmental Remote Sensing, and CMS-TRK-ED6 Retrieval of Land Surface Properties from Optical and Microwave Remote Sensing.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 95 hours. The language of the examination is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 150 hours.

Duration of the module	The module lasts 1 semester.

Module name	Hydrological Modeling
Module number	CMS-TRK-EM1
Module coordinator	Prof. Dr. Niels Schütze niels.schuetze@tu-dresden.de
Learning goals	Students will be able to describe the mechanisms of hydrological processes using appropriate models. Furthermore, students will be able to independently create, develop, and operate hydrological models, as well as critically and objectively evaluate their results.
Course Content	The module covers the fundamentals of the possibilities and limitations of modeling hydrological processes using various model types, the creation, parameterization, and application of abstract models, the objective assessment of uncertainties, and the critical evaluation of model results.
Teaching and learning methods	The module comprises lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of advanced mathematics, such as differential calculus, partial differential equations, integral calculus, and linear algebra at the bachelor's level, is required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a portfolio representing 50 hours of work. The language of the examination is either German or English, at the student's discretion.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts one semester.

Module name	Individual-Based Ecology and Modeling
Module Number	CMS-TRK-EM5
Module coordinator	Prof. Dr. Uta Berger uta.berger@tu-dresden.de
Learning goals	Students will gain a fundamental understanding of the dynamics of complex ecological systems and the resulting formation of spatio-temporal structures. Students will be able to apply key modeling tools and will be capable of independently developing simple simulation models, conducting experiments, and evaluating and interpreting the results using, among other tools, the statistical software R. In doing so, they are able to identify uncertainties and assess the suitability and quality of models for specific applications. They can understand and evaluate scientific literature on the subject and incorporate its content into their own modeling. Furthermore, they can understand complex individual- or agent-based models and apply them in practice to research questions, particularly in animal ecology and forestry.
Contents	The module covers theoretical concepts of individual-based ecology, general fundamentals of modeling, principles of individual-based and agent-based modeling, the development and implementation of individual- or agent-based simulation models, the conduct of simulation experiments, and the analysis of results to understand complex ecological systems. The module also covers powerful, easy-to-learn software platforms such as NetLogo, R, or Python.
Teaching and Learning Formats	The module consists of lectures totaling 1 SWS, exercises totaling 3 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English; the specific language will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Basic knowledge of data analysis with R and applied statistics at the bachelor's level is required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed . The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for the Awarding of Credit Points	Credit points are awarded upon passing the module exam. The module exam consists of a comprehensive assignment totaling 60 hours. The language of the exam is English.

Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Hydrological Modeling Practice
Module number	CMS-TRK-EM2
Module coordinator	Prof. Dr. Niels Schütze niels.schuetze@tu-dresden.de
Learning goals	Students will master methods for creating and validating complex, high-resolution watershed models and will be able to perform calculations of the watershed's water balance as well as evaluate the results critically, objectively, and in a practical context.
Course Content	The module covers the methods and tools of good hydrological modeling practice, including aspects of sensitivity and uncertainty analysis.
Teaching and Learning Formats	The module comprises lectures totaling 1 SWS, exercises totaling 3 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Students are expected to have acquired the competencies covered in the module CMS-TRK-EM1 Hydrological Modeling.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 60 hours. The language of the examination is either German or English, at the student's discretion.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Numerical Methods in Hydrosciences
Module number	CMS-TRK-EM3
Module coordinator	Prof. Dr. Bernhard Vowinckel bernhard.vowinckel@tu-dresden.de
Learning goals	Students will become familiar with various methods for finding numerical solutions to systems of equations that cannot be solved analytically, as well as selected examples from the hydrosciences in which this problem arises. They will be able to apply numerical methods to selected problems in the hydrosciences, integrate the underlying partial differential equations in space and time using software they have written themselves, analyze this software for its solution behavior, and present the results.
Contents	The module covers problem formulation for hydrosystems, numerical methods for integrating partial differential equations, discretization schemes in space and time, formulation of initial and boundary conditions, interpolation methods, the formulation of linear systems of equations, and solution algorithms for linear systems of equations using self-written software.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of advanced mathematics and physics at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a term paper requiring 50 hours of work. The language of the examination is either German or English, at the student's discretion.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Advanced Model Evaluation
Module number	CMS-TRK-EM4
Module coordinator	Prof. Dr. Andreas Hartmann andreas.hartmann@tu-dresden.de
Learning goals	Students will master a variety of advanced methods for the quantitative evaluation of simulation models in the environmental sciences using various approaches to sensitivity and uncertainty analysis; they will be able to select the appropriate method depending on the requirements and research question; and they will be able to evaluate the results of these methods critically, objectively, and in a way relevant to practical applications.
Course Content	The module covers advanced methods for sensitivity and uncertainty analysis and their application using examples ranging from simple to complex groundwater models.
Teaching and Learning Formats	The module consists of 2 SWS of lectures, 2 SWS of exercises, 1 SWS of tutorials, and self-study. The language of instruction for the lectures, exercises, and tutorials may be German or English; the specific language will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Students are expected to have acquired the competencies covered in the module CMS-TRK-EM2 Hydrological Modeling Practice.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a comprehensive assignment totaling 60 hours. The language of the examination is German.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Recent Methods of Photogrammetric Geodata Acquisition
Module number	CMS-TRK-ES5
Module coordinator	Prof. Dr. Anette Eltner anette.eltner@tu-dresden.de
Learning goals	Students will become familiar with current developments in photogrammetric sensor technology and algorithms for automating photogrammetric analysis methods, and will be able to apply these knowledge and skills in a targeted manner to geodata acquisition tasks.
Course Content	The module covers technologies of modern photogrammetric aerial cameras, direct georeferencing methods, and mobile mapping systems, as well as methods of automatic aerotriangulation, robust estimation methods, and image analysis techniques for extracting 3D GIS information from image data.
Teaching and Learning Formats	The module comprises lectures totaling 2 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of photogrammetry at the bachelor's level is required, including imaging sensors, optics, image processing, geometric fundamentals, georeferencing, stereo analysis, digital elevation models, orthophoto generation, aerotriangulation, and image registration methods. The following literature is recommended for preparation: Kraus, K. (2004): Photogrammetry. De Gruyter Berlin.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a portfolio requiring 15 hours of work. The language of the examination is either German or English, at the student's discretion.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.

Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Climate Change
Module number	CMS-TRK-ES1
Module coordinator	Prof. Dr. Matthias Mauder matthias.mauder@tu-dresden.de
Learning goals	Students will develop a systemic understanding of climate change through an integrated analysis of climatic processes. They will understand complex interrelationships, gain a better understanding of the conflicts surrounding climate-related issues concerning natural resources, and become familiar with the Earth-atmosphere system.
Content	The module covers climate change and its interactions with atmospheric trace substances and vegetation; the management of limited resources in the context of a changing world; and climate change as a key component of global change. Additional topics in the module include the current state of climate research—particularly data, methods, and results, including interactions with the hydrosphere and biosphere—as well as the evolution of the paleoclimate and recent climate change.
Teaching and Learning Formats	The module comprises lectures totaling 2 SWS, seminars totaling 2 SWS, and self-study. The language of instruction for the lectures and seminars may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of mathematics, physics, and chemistry at the bachelor's level is required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a 90-minute written exam and a 30-minute closed-door oral group exam. Both examination components are required for passing. The language of the examination is English in both cases.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade is calculated as the unweighted average of the grades for the individual examination components.

Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Feedbacks between Land Surfaces and the Atmosphere
Module number	CMS-TRK-ES2
Module coordinator	Prof. Dr. Matthias Mauder matthias.mauder@tu-dresden.de
Learning goals	Students will become familiar with the system and modeling of land surface processes at the small-scale level and will be able to describe complex interactions within the soil-plant-atmosphere system using simple models.
Course Content	The module covers energy interactions and feedback loops between the upper soil layer, the plant canopy, and the atmosphere, as well as coupling parameters, analytical approaches, and microscale models for describing these interactions.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of physical processes in the atmosphere and hydrosphere at the bachelor's level, as well as knowledge of physics and mathematics at the basic high school level, is required.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Geodetic Space Techniques for Climate Research
Module number	CMS-TRK-ES3
Module coordinator	Prof. Dr. Martin Horwath martin.horwath@tu-dresden.de
Learning goals	Students will understand the theoretical background and operational principles of geodetic spatial methods, such as satellite gravimetry, satellite altimetry, and global navigation satellite systems, for applications in determining mass redistributions within the Earth system, changes in the surface geometry of the ocean, solid Earth, and ice, and changes in atmospheric parameters in the context of current climate research. They will be able to evaluate some standard data products from geodetic space-based methods and explore new aspects of these methods for climate research.
Contents	The module covers the determination of the gravitational field using satellite gravimetry, the identification of mass redistributions in the Earth system based on temporal changes in the gravitational field, aspects of data analysis for the GRACE (Gravity Recovery and Climate Experiment) mission and its successor missions, aspects of data analysis in determining ice, ocean, and water surface heights and changes in these heights using satellite altimetry, fundamental principles and specific analysis aspects of various applications of Global Navigation Satellite System (GNSS) signal measurements for climate research, as well as applications of imaging remote sensing for determining changes in Earth's surface geometry.
Teaching and Learning Formats	The module comprises lectures totaling 1 SWS, exercises totaling 1 SWS, seminars totaling 1 SWS, and self-study. The language of instruction for the lectures, exercises, and seminars may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	No prior knowledge is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination

	conducted as a group exam lasting 30 minutes. The language of the examination is either German or English, at the student's discretion.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Laser Scanning and 3D Point Cloud Processing
Module number	CMS-TRK-ES6
Module coordinator	Prof. Dr. Anette Eltner anette.eltner@tu-dresden.de
Learning goals	Students will learn the technological fundamentals of laser scanner systems and their applications, and will acquire skills in the acquisition, visualization, handling, and automatic processing of 3D point clouds as well as data fusion; they will be able to acquire, fuse, visualize, and automatically process 3D point clouds.
Course Content	The module covers the technological fundamentals of airborne and terrestrial laser scanning, as well as methods of geometric registration and calibration, filtering techniques, methods for the automatic extraction of geoinformation from 3D point clouds, and applications such as DTM generation, 3D city models, forestry, architecture, and engineering.
Teaching and Learning Formats	The module comprises lectures totaling 2 SWS, exercises totaling 2 SWS, projects totaling 1 SWS, and self-study. The language of instruction for the lectures, exercises, and projects may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge of the fundamentals of photogrammetry—such as imaging sensors, optics, image processing, geometric fundamentals, direct georeferencing, digital elevation models, and image registration methods—at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a portfolio requiring 25 hours of work. The language of the examination is either German or English, at the student's discretion.
Credit Hours and Grades	A total of 10 credit points can be earned through this module. The module grade corresponds to the grade on the final exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 300 hours.

Duration of the module	The module lasts 1 semester.

Module name	Environmental and Climate Remote Sensing
Module number	CMS-TRK-ES4
Module coordinator	Prof. Dr. Matthias Forkel matthias.forkel@tu-dresden.de
Learning goals	Students will gain an understanding of the physical fundamentals of satellite-based remote sensing, as well as typical satellite systems, Earth observation products, and methods for quantifying processes and changes in the climate system and in the global water and carbon cycles. They are familiar with advanced approaches to the analysis of satellite data, in particular change detection, land cover classification, and the derivation of land surface parameters. Students can plan, discuss, and apply remote sensing methods and applications to address issues in the field of climate and environmental monitoring.
Contents	The module covers the physical fundamentals of optical and microwave remote sensing, the characteristics of satellite sensors for environmental observation, and the theoretical foundations for deriving essential climate variables such as soil moisture, CO_2, leaf area index, photosynthesis, biomass, and wildfires. Additional content includes selected methods of time-series and change analysis for deriving land surface properties and land cover classification, as well as their implementation in a script-based programming language.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Knowledge of the fundamentals of remote sensing at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Environmental Science and Engineering track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual exam lasting 15 minutes . The student may choose to take the exam in either German or English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.

Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Applied Bioinformatics
Module number	CMS-TRK-ABI
Module coordinator	Prof. Dr. Michael Schroeder michael.schroeder@tu-dresden.de
Learning goals	Students will master the methodological fundamentals of sequence analysis and other bioinformatics algorithms. They will be familiar with key algorithms and will be able to classify, analyze, and evaluate them in terms of their objectives and efficiency.
Course Content	The module covers the fundamentals of sequence comparison, particularly algorithms such as the Levenshtein distance, dynamic programming, global and local alignment, substitution matrices, and multiple sequence alignment.
Teaching and Learning Formats	The module consists of 2 SWS of lectures, 2 SWS of exercises, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Basic knowledge of computer programming, the fundamentals of cell and molecular biology, as well as probability and statistics at the bachelor's level is required.
Applicability	This module is a required module in the Computational Life Science track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam is conducted in English.
Credit Hours and Grades	Students can earn 5 credit points for this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Modeling and Simulation in Biology
Module number	CMS-TRK-MOS
Module coordinator	Prof. Dr. Ivo Sbalzarini ivo.sbalzarini@tu-dresden.de
Learning goals	Students will master the modeling and simulation of biological systems in space and time. They will be able to independently derive models of biological processes, formulate them mathematically, and simulate them numerically on a computer. They will be able to independently design and implement the corresponding simulation codes.
Course Content	The module's content covers model scaling, dimensional analysis, the storage and flux method for modeling dynamic systems, the control volume method for modeling spatiotemporal systems, vector analysis, conservative fields, finite-difference simulation of temporal systems, particle methods for simulating spatiotemporal systems, and applications in diffusion, reaction-diffusion, advection-diffusion, and flows and currents.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both the lectures and the exercises is English.
Prerequisites	Knowledge of physics at the advanced-level Abitur course level, programming skills in a computer language such as Python, and knowledge of calculus and vector calculus at the bachelor's level are required.
Applicability	This module is a required module in the Computational Life Science track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam is conducted in English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Computational Life Science Team Project
Module number	CMS-TRK-TEA-CLS
Module coordinator	Prof. Dr. Ivo Sbalzarini ivo.sbalzarini@tu-dresden.de
Learning goals	Students will be able to work on a complex, research-oriented project. Students will be able to solve a larger, typically interdisciplinary problem in the field of computational life sciences as part of a group of 2 to 4 people. They will master literature research and the use of scientific information sources and will possess in-depth subject expertise as well as extensive methodological and interpersonal skills related to project management and teamwork.
Content	The module focuses on the interdisciplinary analysis, application, and communication of a topic of the student's choice, for example from the fields of bioinformatics, computational biology, biological or medical AI, scientific computing for the life sciences, biomedical computer vision and visualization, or mathematical modeling of living systems.
Teaching and learning methods	The module comprises projects totaling 8 SWS and self-study. The language of instruction for the projects is English.
Prerequisites	Independent programming skills in any computer language are required, as well as proficiency in algorithms and data structures, analysis of univariate and multivariate functions, linear algebra, probability theory, and statistics at the bachelor's level.
Applicability	This module is a required module in the Computational Life Science track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credit points are awarded upon passing the module exam. The module exam consists of a comprehensive assignment totaling 80 hours. The exam is conducted in English.
Credits and Grades	A total of 10 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every semester.
Workload	The total workload is 300 hours.
Duration of the module	The module lasts 1 semester.

Module name	Advanced Biological Physics
Module number	CMS-TRK-ABP
Module coordinator	Prof. Dr. Benjamin Friedrich benjamin.m.friedrich@tu-dresden.de
Learning goals	Students will gain in-depth knowledge of theoretical biological physics and become familiar with key models, methods for the mathematical modeling of biological systems, and concepts of continuum mechanics. Students will think in an interdisciplinary manner and be able to apply the theoretical knowledge they have acquired to independently develop mathematical models for describing biological processes.
Course Content	The module covers the polymerization dynamics of biopolymers, force generation by molecular motors, cell and tissue mechanics, as well as concepts of continuum mechanics and their application to the description of biological systems.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Mathematical knowledge such as integral and differential calculus, ordinary and partial differential equations, basic knowledge of statistical physics, and a fundamental understanding of simple polymer models at the bachelor's level is required. The following literature is recommended for preparation: 1. Biological Physics. Philip Nelson. Chiliagon Science, 2020, 2. *Mechanics of Motor Proteins and the Cytoskeleton*. Jonathon Howard. * * Sinauer Associates is an imprint of Oxford University Press, 2001, 3. Soft Condensed Matter Physics in Molecular and Cell Biology. W. C. K. Poon, David Andelman. CRC Press, 2019, 4. Principles of Condensed Matter Physics. P.M. Chaikin, T.C. Lubensky. Cambridge University Press, 1995, 5. Hydrodynamics. L.D. Landau, E.M. Lifshitz. Pergamon Press, Oxford. 6. Low-Reynolds Number Hydrodynamics. John Happel, Howard Brenner, Springer, 2009, 7. Non-Equilibrium Thermodynamics. S. R. de Groot, P. Mazur. Dover Publications Inc., 1984.
Applicability	This module is an elective compulsory module in both the Computational Life Science track and the Computational Mathematics track of the Master's program in Computational Modeling and Simulation, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling , and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3

	of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under “Prerequisites.”
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual exam lasting 30 minutes. The language of the examination is English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Interactive Multimedia Information Retrieval
Module number	CMS-TRK-IMIR
Module coordinator	Dr. Annett Mitschick annett.mitschick@tu-dresden.de
Learning goals	Students will acquire practical knowledge in the field of interactive retrieval and content-based exploration of multimedia data and documents. They will be familiar with the key methods and techniques for implementing search interfaces tailored to user needs and usage patterns, and will be able to evaluate specific interactive information retrieval systems and develop their own concepts.
Course Content	The module covers the fundamentals of information retrieval, methods and techniques for content-based search in multimedia data—particularly audiovisual data—as well as principles of feature extraction and metadata extraction. Additional topics include the fundamentals of designing search interfaces tailored to user needs and usage patterns, taking into account insights from the field of information seeking behavior.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English; the specific language will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Knowledge in the field of human-computer interaction is required. The following literature is recommended for preparation: 1. Interaction Design: Beyond Human-Computer Interaction, 6th Edition. Yvonne Rogers, Helen Sharp, Jennifer Preece. John Wiley & Sons, 2023. ISBN: 978-1-119-90109-9, 2. Human-Computer Interaction, 3rd Edition. Alan Dix, Janet Finlay, Gregory D. Abowd, Russel Beale. Pearson Prentice Hall, 2002. ISBN: 978-0-13-046109-4.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Visual Computing track and the Computational Life Science track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. This module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. This module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.

Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Geometric Modeling and Animation
Module number	CMS-TRK-GMA
Module coordinator	Prof. Dr. Stefan Gumhold stefan.gumhold@tu-dresden.de
Learning goals	Students will gain an overview of the hardware and algorithms required to create an animatable digital representation of a human character. They will gain an overview of surface representations and become familiar with the basic algorithms used to analyze and visualize these surface representations. They will be able to assess which 3D scanning technology is best suited for a given application. They are familiar with the algorithms required to generate surface models from 3D scans. They understand the mathematical representations for rigid-body transformations and can apply them to the articulation of 3D models. They have an overview of character animation techniques and know how to convert a simulated surface into a character animation.
Contents	The module covers surface representations using point-based, implicit, and subdivision-based representations, 3D scans, including a discussion of scanning methods and scan processing algorithms; skeleton-based object representations using mathematical representations for rigid-body transformations; representations for articulated objects; fundamentals of inverse kinematics; and algorithms for extracting skeleton representations. Additional content includes character animation and various techniques for representing and animating virtual humans.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both the lectures and the exercises is English.
Prerequisites	Students are expected to have acquired the competencies covered in the CMS-TRK-FCG Foundations of Computer Graphics module.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in both the Visual Computing track and the Computational Life Science track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. Completing 15 hours of practice exercises counts as a bonus toward the written exam. The exam language is English.

Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Active Matter Hydrodynamics
Module number	CMS-TRK-AMH
Module coordinator	Prof. Dr. Stephan Grill grill@mpi-cbg.de
Learning goals	Students will acquire in-depth knowledge of theoretical biological physics. They will be familiar with concepts and methods for the mathematical description of spatiotemporal dynamics, as well as key models of active biological matter. Students will be able to apply the theoretical knowledge they have acquired to independently develop mathematical models for describing biological processes.
Course Content	The module covers the hydrodynamics of active matter, 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, the dynamics of active fluids, as well as liquid crystal theory and active gel theory.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Mathematical knowledge such as integral and differential calculus, ordinary and partial differential equations, basic knowledge of statistical physics, and fundamental knowledge of simple polymer models at the bachelor's level is required. The following literature is recommended for preparation: 1. Biological Physics. Philip Nelson. Chiliagon Science, 2020, 2. Mechanics of Motor Proteins and the Cytoskeleton. Jonathon Howard. Sinauer, 2005, 3. Soft Condensed Matter Physics in Molecular and Cell Biology. W. C. K. Poon, David Andelman. CRC Press, 2006. 4. Principles of Condensed Matter Physics. P.M. Chaikin, T. C. Lubensky. Cambridge University Press, 2000, 5. Non-Equilibrium Thermodynamics. S. R. de Groot, P. Mazur. Dover Publications Inc., 1984.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Computational Life Science track and the Computational Mathematics track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."

Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a closed-door oral exam administered individually and lasting 30 minutes. The exam is conducted in English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Foundations of Virtual Reality
Module number	CMS-TRK-FVR
Module coordinator	Jun. Prof. Dr. Matthew McGinity matthew.mcginity@TU Dresden
Learning goals	Students will learn the fundamentals of virtual reality and immersive media technologies. This includes knowledge of the perceptual and psychological foundations of immersive media and a basic understanding of the technical challenges involved in developing immersive systems and experiences.
Course Content	The module covers definitions and the history of immersive media and related concepts; the fundamentals of visual, auditory, haptic, and multisensory perception; head tracking and head-mounted displays; 3D tracking; spatial audio and haptic interfaces; embodiment; social presence; software architectures; and world models for immersive in-situ simulations.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	A bachelor's-level understanding of the fundamentals of human-computer interaction, software technology, and computer graphics is required.
Availability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Visual Computing track and the Computational Life Science track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Physics-Based Graphics
Module number	CMS-TRK-PBG
Module coordinator	Prof. Dr. Stefan Gumhold stefan.gumhold@tu-dresden.de
Learning goals	Students will gain an overview of the application of physics in computer graphics. They will be familiar with Newton's axioms and the most important laws of motion. They will be able to derive equations of motion. They are familiar with the rendering equation in various forms, can explain its individual components in detail, and can derive the relationships between different forms. They are proficient in Monte Carlo and cache-based solution methods and can implement them and analyze them in terms of runtime, error, and bias. They are familiar with models for reflection off surfaces as well as for emission and can assess which materials and light sources can be approximated using these models. You are familiar with the fundamentals of physically based animation, can numerically solve ordinary differential equations, and know which phenomena are simulated using particles in computer graphics. You are familiar with rigid-body modeling in detail and know how to handle collisions. In fluid simulation, you are familiar with the Navier-Stokes equations as well as efficient solution methods for incompressible fluids that are suitable for fast simulation.
Contents	The module covers physical fundamentals such as the numerical solution of differential equations, global illumination, and physically based simulation. The section on global illumination includes the rendering equation, models for surface representation and light sources, as well as stochastic and cache-based solution methods for the rendering equation. In the area of physically based simulation, the module covers simulation techniques for rigid bodies, including collision handling, as well as selected topics from the fields of fluid simulation, clothing simulation, and soft-body simulation.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	Students are expected to have acquired the competencies covered in the module CMS-TRK-FCG Foundations of Computer Graphics.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Visual Computing track and the Computational Life Science track, and must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simu lation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the

	Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under “Prerequisites.”
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual test lasting 20 minutes. A bonus component to the oral examination is the completion of practice exercises totaling 15 hours. The language of the examination is English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Numerical Methods for Partial Differential Equations—Basic Concepts
Module number	CMS-TRK-MA28
Module coordinator	Director of the Institute of Numerical Mathematics id.numerik@TU Dresden
Learning goals	Students will be able to independently analyze specific elliptic problems and solve them numerically by selecting appropriate discretization techniques in suitable Sobolev spaces, as well as apply error estimator techniques and adaptive discretization techniques to problems involving partial differential equations.
Contents	The module covers discretization techniques for elliptic problems, a priori and a posteriori error estimation techniques, properties of Sobolev spaces, and fundamental principles of convergence analysis.
Teaching and Learning Formats	The module consists of lectures totaling 3 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	A bachelor's-level understanding of the numerics of ordinary differential equations, as well as of Hilbert spaces and linear operators, is required. The following literature is recommended for preparation: Numerical Mathematics 2: Integration of Ordinary Differential Equations. Peter Deuflhard, Folkmar Bornemann. De Gruyter, 1995.
Applicability	This module is a required module in the Computational Mathematics track of the Master's program in Computational Modeling and Simulation. This module is an elective compulsory module in the Computational Modeling in Energy Economics track of the Master's program in Computational Modeling and Simulation, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual exam lasting 25 minutes . The student may choose to take the exam in either German or English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.

Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Modeling Case Studies
Module Number	CMS-TRK-MAMS
Module coordinator	Director of the Institute of Scientific Computing id.wir@TU Dresden.de
Learning goals	Students will gain a systematic understanding of how applied problems can be formulated mathematically, appropriately simplified, and solved numerically. They will be able to present their results in a way that is understandable to non-mathematicians.
Content	The module covers the mathematical modeling and treatment of problems from fields outside mathematics, preferably using partial differential equations.
Teaching and learning methods	The module consists of seminars totaling 4 SWS, projects totaling 6 SWS, and self-study. The language of instruction for the seminars and projects is English.
Prerequisites	Knowledge of partial differential equations at the bachelor's level is required.
Applicability	This module is a required module in the Computational Mathematics track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of an ungraded combined term paper requiring 40 hours of work. The language of the exam is either German or English, at the student's discretion.
Credits and Grades	A total of 10 credit points can be earned through this module. The module exam is graded as "pass" or "fail."
Module frequency	The module is offered every summer semester.
Workload	The total workload is 300 hours.
Duration of the module	The module lasts 1 semester.

Module name	Scientific Computing—Advanced Concepts
Module number	CMS-TRK-MA32
Module coordinator	Director of the Institute of Scientific Computing id.wir@TU Dresden.de
Learning goals	Students will gain a systematic understanding of modeling concepts and become familiar with appropriate numerical methods and their theoretical foundations. They will acquire fundamental experience in the algorithmic implementation of methods and their application to relevant problems.
Content	The module covers aspects of mathematical modeling as well as theoretical and practical aspects of numerical methods.
Teaching and Learning Formats	The module consists of lectures totaling 3 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English; the specific language will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Competencies in modeling and simulation as well as in partial differential equations at the bachelor's level are required. The following literature is recommended for preparation: Mathematical Modeling. Christof Eck, Harald Garcke, Peter Knabner. Springer, 2017.
Applicability	This module is a required module in the Computational Mathematics track of the Master's program in Computational Modeling and Simulation. This module is an elective compulsory module in the Computational Modeling in Energy Economics track of the Master's program in Computational Modeling and Simulation, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam language is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts one semester.

Module name	Computational Mathematics Research Work
Module Number	CMS-TRK-PRO-CMA
Module coordinator	Prof. Dr. Axel Voigt axel.voigt@tu-dresden.de
Learning goals	Students will master the independent handling of a project involving tasks from applications of mathematics in other fields, the analysis and improvement of algorithms, and the generalization or specialization of mathematical results. Students will be able to familiarize themselves with the project's objectives within a project group, discuss possible approaches and solutions, and define the steps needed to complete the task; acquire the necessary detailed theoretical knowledge and computational tools; contribute to the project based on their respective strengths; and use limited time resources efficiently.
Contents	The module covers the analysis and improvement of algorithms, the generalization and specialization of mathematical results, and the interdisciplinary application and communication of mathematical solutions.
Teaching and learning methods	The module comprises seminars totaling 2 SWS, projects totaling 2 SWS, and self-study. The language of instruction for the seminars and projects may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	No prior knowledge is required.
Applicability	This module is a required module in the Computational Mathematics track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a closed-door oral exam administered individually and lasting 20 minutes. The exam is conducted in English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Introduction to Mathematical Biology I: Discrete Models
Module number	CMS-TRK-IMB1
Module coordinator	Prof. Dr. Andreas Deutsch andreas.deutsch@tu-dresden.de
Learning goals	Students will be able to develop discrete, stochastic, and mathematical models for biological problems, analyze biomathematical problems, determine analytical and numerical solutions, and apply the models in practice.
Course Content	The module covers discrete models such as cellular automata, stochastic processes, and Moran models, as well as biological applications such as collective cell migration, biological patterning, and tumor invasion and progression. Additional topics include multiscale analysis of discrete models, particularly mean-field approximations and linear stability analysis.
Teaching and learning methods	The module consists of lectures totaling 2 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for both lectures and exercises is English.
Prerequisites	Knowledge of mathematics and physics at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Mathematics track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a closed-door oral exam administered individually and lasting 15 minutes. The exam is conducted in English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Numerical Methods for Partial Differential Equations—Advanced Concepts
Module number	CMS-TRK-MA29
Module coordinator	Director of the Institute of Numerical Mathematics id.numerik@TU Dresden
Learning goals	Students will gain a systematic understanding of fundamental models; they will be able to adapt discretization techniques to specific models; and they will have a clear understanding of recent developments and current issues in the numerical solution of partial differential equations. They are able to independently analyze specific problems and solve them numerically using the techniques provided, and they understand the potential and limitations of the methods covered in terms of efficiency and accuracy.
Contents	The module covers advanced concepts in the analytical and numerical treatment of problems involving partial differential equations, such as the analysis and numerical application of model-adapted discretization techniques, as well as the theory and numerical methods for optimal control problems.
Teaching and Learning Formats	The module consists of lectures totaling 3 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Students are expected to have acquired the competencies in the numerical analysis of partial differential equations covered in the module CMS-TRK-MA28 Numerical Methods for Partial Differential Equations – Basic Concepts.
Applicability	In the master's program in Computational Modeling and Simulation, this module is an elective compulsory module in both the Computational Mathematics track and the Computational Modeling in Energy Economics track, to be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual exam lasting 25 minutes . The student may choose to take the exam in either German or English.

Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Mathematical Methods in Continuum Mechanics
Module number	CMS-TRK-MA30
Module coordinator	Director of the Institute of Scientific Computing id.wir@TU Dresden.de
Learning goals	Students will acquire in-depth knowledge of the equations of continuum mechanics and their analytical properties. They will be familiar with the mathematical methods used in continuum mechanics, enabling them to present and apply these methods. They will develop a solid ability to independently analyze and solve mathematical problems, as well as to apply these skills to new phenomena and find solutions.
Course Content	The module covers continuum mechanics modeling of fluids and solids, the derivation of models for solids and fluids—such as linear and nonlinear elasticity, plasticity, Stokes, Euler, Navier-Stokes, and their analysis using methods of partial differential equations and the calculus of variations, as well as current concepts and research questions, for example from the field of multiscale analysis.
Teaching and Learning Formats	The module comprises lectures totaling 3 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	A bachelor's-level understanding of functional analysis and partial differential equations is required. The following literature is recommended for preparation: Alt, H. W.: Linear Functional Analysis, Springer.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Mathematics track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules that list it under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual test lasting 25 minutes . The student may choose to take the examination in either German or English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.

Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Introduction to Mathematical Biology II: Continuum Models
Module number	CMS-TRK-IMB2
Module coordinator	Dr. Lutz Brusch lutz.brusch@tu-dresden.de
Learning goals	Students will be able to develop continuous, deterministic mathematical models for biological problems, analyze biomathematical problems, determine analytical and numerical solutions, and apply the models in practice.
Course Content	The module covers selected spatiotemporal processes in cell and developmental biology, mathematical models in the form of ordinary and partial differential equations, and their mathematical and computational analysis—including linear stability analysis of the model solutions, bifurcation analysis, metabolic control analysis, and the biological interpretation of the mathematical results—as well as computational tools such as Copasi, XPP-AUT, and Morpheus.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises is English.
Prerequisites	Knowledge of mathematics and physics at the bachelor's level is required.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Mathematics track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a closed-door oral examination administered as an individual exam lasting 15 minutes. The language of the examination is English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade received on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Applied Power System Economics
Module Number	CMS-TRK-APSE
Module coordinator	Prof. Dr. Dominik Möst dominik.moest@tu-dresden.de
Learning goals	Students will be familiar with the fundamentals and methods of economic theory as applied to the electricity sector. They will be able to analyze the electricity sector from an economic perspective.
Course Content	The module covers the model-based analysis of liberalized electricity systems, the modeling and analysis of interactions between regulatory and market-based framework conditions in electricity markets, and the operational and investment decisions of power plant operators in liberalized electricity systems.
Teaching and learning methods	The module includes projects totaling 4 SWS and self-study. The language of instruction for the projects may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	No prior knowledge is required.
Applicability	This module is a required module in the Computational Modeling in Energy Economics track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a portfolio requiring 60 hours of work. The exam is conducted in English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Electric Power Markets
Module number	CMS-TRK-EPM
Module coordinator	Prof. Dr. Dominik Möst dominik.moest@tu-dresden.de
Learning goals	Students will be familiar with the fundamentals and methods of economic theory as applied to the electricity sector. They will be able to analyze the electricity sector from an economic perspective.
Course Content	The module covers techno-economic issues in the electricity industry, methods, knowledge, and interrelationships in the areas of energy market structures, techno-economic analyses, as well as the modeling and optimization of energy systems and the modeling of energy markets.
Teaching and Learning Formats	The module consists of lectures totaling 2 SWS, exercises totaling 2 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English; the specific language will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	No prior knowledge is required.
Applicability	This module is a required module in the Computational Modeling in Energy Economics track of the Computational Modeling and Simulation master’s program. This module fulfills the prerequisites for the modules listed under “Prerequisites.”
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a 90-minute written exam. The exam is conducted in English.
Credits and Grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module lasts 1 semester.

Module name	Case Studies in Energy Economics
Module number	CMS-TRK-CSEE
Module coordinator	Prof. Dr. Dominik Möst dominik.moest@tu-dresden.de
Learning goals	Students will be able to independently address complex issues in energy and risk management and resource economics, as well as to develop and apply their own concepts for integrating economic aspects into decision-making. Students will be able to work in teams and will have mastered literature research and the use of academic information sources.
Contents	The module covers current techno-economic issues in the energy sector, the modeling of commodity markets, the representation and modeling of uncertainties in the energy sector, and the economic modeling of power grids.
Teaching and learning methods	The module includes seminars totaling 0.5 SWS, projects totaling 120 hours, and self-study. The language of instruction for the seminars and projects may be German or English; the specific language will be determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Students are expected to have acquired the competencies covered in the modules CMS-TRK-EPM Electric Power Markets, CMS-COR-HPC High-Performance Computing, and CMS-COR-ML Machine Learning.
Applicability	This module is a required module in the Computational Modeling and Simulation master's program within the Computational Modeling in Energy Economics track. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a term paper requiring 120 hours of work and a closed-door oral exam administered as a group exam lasting 30 minutes. Both exam components are required for passing the module. The language of the exam is English.
Credits and Grades	A total of 10 credit points can be earned through this module. The module grade is calculated as the unweighted average of the grades for the individual examination components.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 300 hours.
Duration of the module	The module lasts 1 semester.

Module name	Resource Economics and Environmental Policy
Module number	CMS-TRK-REEP
Module coordinator	Prof. Dr. Dominik Möst dominik.moest@tu-dresden.de
Learning goals	Students will gain knowledge of and mastery over the theory of exhaustible resources. They will be able to answer questions regarding market and price structures in commodity markets, as well as apply and critically evaluate optimization methods in the energy sector.
Course Content	The module covers the fundamentals of resource economics and environmental policy, current and applied theories and models in these fields—such as the Hotelling rule—as well as the basics of environmental policy tax instruments.
Teaching and learning methods	The module comprises lectures totaling 2 SWS, exercises totaling 2 SWS, projects totaling 2 SWS, and self-study. The language of instruction for the lectures, exercises, and projects is English.
Prerequisites	Students are expected to have acquired the competencies covered in the modules CMS-TRK-EPM Electric Power Markets, CMS-COR-HPC High-Performance Computing, and CMS-COR-ML Machine Learning.
Applicability	This module is a required module in the Computational Modeling in Energy Economics track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a 90-minute written exam and a term paper requiring 150 hours of work. Both components are required for passing. The language of the exam is English.
Credits and Grades	A total of 10 credit points can be earned through this module. The module grade is calculated as the weighted average of the grades for the individual assessment components. The written exam is weighted twice, and the term paper is weighted once.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 300 hours.
Duration of the module	The module lasts 1 semester.

Module name	Literature Studies in Energy Economics
Module number	CMS-TRK-LSEE
Module coordinator	Prof. Dr. Dominik Möst dominik.moest@tu-dresden.de
Learning goals	Students will be able to independently search and evaluate scientific literature in the field of energy economics and present the results in a clear and understandable manner.
Course Content	The module covers in-depth techno-economic issues in the energy sector, advanced modeling of commodity markets, advanced representation and modeling of uncertainties in the energy sector, and advanced economic modeling of power grids.
Teaching and learning methods	The module includes projects totaling 4 SWS and self-study. The language of instruction for the projects may be German or English; it will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Participants are expected to have acquired the competencies covered in the CMS-TRK-EPM Electric Power Markets module.
Availability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Modeling in Energy Economics track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under Section 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a term paper requiring 100 hours of work and an ungraded, non-public oral examination conducted as a group exam lasting 30 minutes. Both examination components are required for passing the module. The language of the examination is English in both cases.
Credit Hours and Grades	A total of 5 credit points can be earned through this module. The module grade is calculated, in accordance with Section 15, Paragraph 1, Sentence 6 of the General Examination Regulations, as the unweighted average of the grades for the individual examination components.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Duration of the module	The module spans 1 semester.

Module name	Optimization in Modern Electricity Markets
Module number	CMS-TRK-OMEM
Module coordinator	Dr. Hannes Hobbie hannes.hobbie@tu-dresden.de
Learning goals	Students will be able to understand the decision-making behavior of relevant stakeholders in modern electricity markets, distinguish between suitable models for representing this behavior, and independently formulate such models in appropriate modeling environments. They will be able to evaluate factors influencing decision-making behavior by applying advanced optimization methods and present and discuss results to support decision-making in structured texts.
Contents	The module covers the confident application of various operations research methods for decision support in selected use cases from the electricity industry, as well as the use of corresponding modeling environments, in particular the General Algebraic Modeling System (GAMS).
Teaching and Learning Formats	The module comprises lectures totaling 1 SWS, exercises totaling 1 SWS, and self-study. The language of instruction for the lectures and exercises may be German or English and will be specifically determined by the lecturer at the beginning of each semester and announced in the customary manner.
Prerequisites	Students are expected to have acquired the competencies covered in the CMS-TRK-EPM Electric Power Markets module.
Applicability	In the Computational Modeling and Simulation master's program, this module is an elective compulsory module in the Computational Modeling in Energy Economics track, which must be selected in accordance with Appendix 2 of the Specific Examination Regulations. The module cannot be selected in the Master's program in Computational Modeling and Simulation if this module—or a module with substantially the same content from a degree program that fulfilled the admission requirements under § 3 of the Study Regulations—has already been completed. The module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a portfolio representing 80 hours of work. The language of the examination is English.
Credit points and grades	A total of 5 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.

Duration of the module	The module spans 1 semester.

Module name	Visual Computing Team Project
Module Number	CMS-TRK-TEA-VC
Module coordinator	Prof. Dr. Stefan Gumhold stefan.gumhold@tu-dresden.de
Learning goals	Students will be able to work on a complex, research-oriented project. Students will be able to work in a group to solve a larger, typically interdisciplinary problem in the field of visual computing. Students will master literature research and the use of scientific information sources and will possess in-depth subject expertise as well as extensive methodological and social skills related to project management and teamwork.
Content	The module covers concepts and methods of digital representation and processing of visual data, including interdisciplinary aspects of modeling, analysis, and visualization, as well as key topics from current research projects within the Chair's research environment and from application-oriented questions in visual data processing.
Teaching and learning methods	The module consists of projects totaling 8 SWS and self-study. The language of instruction for the projects is English.
Prerequisites	No prior knowledge is required.
Applicability	This module is a required module in the Visual Computing track of the Computational Modeling and Simulation master's program. This module fulfills the prerequisites for the modules listed under "Prerequisites."
Requirements for Awarding Credit Points	Credits are awarded upon passing the module exam. The module exam consists of a comprehensive assignment totaling 80 hours. The exam is conducted in English.
Credits and Grades	A total of 10 credit points can be earned through this module. The module grade corresponds to the grade on the exam.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 300 hours.
Duration of the module	The module lasts 1 semester.

Appendix 2
(Regarding Section 6, Paragraph 5)
Study Plan for the Full-Time Program
including the type and scope of courses in SWS as well as required coursework, the type, scope, and structure of which are specified in the module descriptions

Legend:

LP	Credit Points	M	Mobility window pursuant to Section 6, Paragraph 1, Sentence 3	PL	Exam(s)
V	Lecture	Ü	Seminar	S	Seminar
P	Internship	T	Tutorial	SK	Language Course
Pj	Project				

*) The topic for the master's thesis is assigned at the end of the 3rd semester.

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
Required Courses						
CMS-SOF	Soft Skills	0/0/2/0 1 PL				2
CMS-PRO	Research Assignment			12 SWS per year 1 credit		15
Elective-Required Courses						
Basic Language Training Choose 1 out of 74 modules.						
CMS-LN-A1-1A	Foreign Language A1 Advanced Level - Arabic		4 SWS SK 1 PL			5
CMS-LN-A1-1C	Foreign Language A1 Advanced Level - Chinese		4 SWS SK 1 PL			5
CMS-LN-A1-1D	Foreign Language A1 Advanced Level - German as a Foreign Language		4 SWS SK 1 PL			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-LN-A1-1FI	Foreign Language A1 Advanced Level - Finnish		4 SWS SK 1 PL			5
CMS-LN-A1-1FR	Foreign Language A1 Advanced Level - French		4 SWS SK 1 PL			5
CMS-LN-A1-1I	Foreign Language A1 Advanced Level - Italian		4 SWS SK 1 PL			5
CMS-LN-A1-1J	Foreign Language A1 Advanced Level - Japanese		4 SWS SK 1 PL			5
CMS-LN-A1-1PL	Foreign Language A1 Advanced Level - Polish		4 SWS SK 1 PL			5
CMS-LN-A1-1PG	Foreign Language A1 Advanced Level - Portuguese		4 SWS SK 1 PL			5
CMS-LN-A1-1RU	Foreign Language A1 Advanced Level - Russian		4 SWS SK 1 PL			5
CMS-LN-A1-1SW	Foreign Language A1 Advanced Level - Swedish		4 SWS SK 1 PL			5
CMS-LN-A1-1SP	Foreign Language A1 Advanced Level - Spanish		4 SWS SK 1 PL			5
CMS-LN-A1-1T	Foreign Language A1 Advanced Level - Czech		4 SWS SK 1 PL			5
CMS-LN-A2-A	Foreign Language A2 - Arabic		4 SWS SK 1 PL			5
CMS-LN-A2-C	Foreign Language A2 - Chinese		4 SWS SK 1 PL			5
CMS-LN-A2-D	Foreign Language A2 - German as a Foreign Language		4 SWS SK 1 PL			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-LN-A2-FI	Foreign Language A2 - Finnish		4 SWS SK 1 PL			5
CMS-LN-A2-J	Foreign Language A2 - Japanese		4 SWS SK 1 PL			5
CMS-LN-A2-PL	Foreign Language A2 - Polish		4 SWS SK 1 PL			5
CMS-LN-A2-RU	Foreign Language A2 - Russian		4 SWS SK 1 PL			5
CMS-LN-A2-T	Foreign Language A2 - Czech		4 SWS SK 1 PL			5
CMS-LN-A2-1A	Foreign Language A2 Advanced Level - Arabic		4 SWS SK 1 PL			5
CMS-LN-A2-1D	Foreign Language A2 Advanced Level - German as a Foreign Language		4 SWS SK 1 PL			5
CMS-LN-A2-1F	Foreign Language A2 Advanced Level - French		4 SWS SK 1 PL			5
CMS-LN-A2-1I	Foreign Language A2 Advanced Level - Italian		4 SWS SK 1 PL			5
CMS-LN-A2-1PL	Foreign Language A2 Advanced Level - Polish		4 SWS SK 1 PL			5
CMS-LN-A2-1PG	Foreign Language A2 Advanced Level - Portuguese		4 SWS SK 1 PL			5
CMS-LN-A2-1RU	Foreign Language A2 Advanced Level - Russian		4 SWS SK 1 PL			5
CMS-LN-A2-1SW	Foreign Language A2 Advanced Level - Swedish		4 SWS SK 1 PL			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-LN-A2-1SP	Foreign Language A2 Advanced Level - Spanish		4 SWS SK 1 PL			5
CMS-LN-A2-1T	Foreign Language A2 Advanced Level - Czech		4 SWS SK 1 PL			5
CMS-LN-A2-1C	Foreign Language A2 Advanced Level - Chinese		4 SWS SK 1 PL			5
CMS-LN-A2-1J	Foreign Language A2 Advanced Level - Japanese		4 SWS SK 1 PL			5
CMS-LN-B1-A	Foreign Language B1 - Arabic		4 SWS SK 1 PL			5
CMS-LN-B1-D	Foreign Language B1 - German as a Foreign Language		4 SWS SK 1 PL			5
CMS-LN-B1-F	Foreign Language B1 - French		4 SWS SK 1 PL			5
CMS-LN-B1-I	Foreign Language B1 - Italian		4 SWS SK 1 PL			5
CMS-LN-B1-PG	Foreign Language B1 - Portuguese		4 SWS SK 1 PL			5
CMS-LN-B1-RU	Foreign Language B1 - Russian		4 SWS SK 1 PL			5
CMS-LN-B1-SP	Foreign Language B1 - Spanish		4 SWS SK 1 PL			5
CMS-LN-B1-C	Foreign Language B1 - Chinese		4 SWS SK 1 PL			5
CMS-LN-B1-J	Foreign Language B1 - Japanese		4 SWS SK 1 PL			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-LN-B1-1A	Foreign Language B1 Advanced Level - Arabic		4 SWS SK 1 PL			5
CMS-LN-B1-1D	Foreign Language B1 Advanced Level - German as a Foreign Language		4 SWS SK 1 PL			5
CMS-LN-B1-1FR	Foreign Language B1 Advanced Level - French		4 SWS SK 1 PL			5
CMS-LN-B1-1I	Foreign Language B1 Advanced Level - Italian		4 SWS SK 1 PL			5
CMS-LN-B1-1RU	Foreign Language B1 Advanced Level - Russian		4 SWS SK 1 PL			5
CMS-LN-B1-1SW	Foreign Language B1 Advanced Level - Swedish		4 SWS SK 1 PL			5
CMS-LN-B1-1SP	Foreign Language B1 Advanced Level - Spanish		4 SWS SK 1 PL			5
CMS-LN-B1-1PG	Foreign Language B1 Advanced Level - Portuguese		4 SWS SK 1 PL			5
CMS-LN-B1-1C	Foreign Language B1 Advanced Level - Chinese		4 SWS SK 1 PL			5
CMS-LN-B1-1J	Foreign Language B1 Advanced Level - Japanese		4 SWS SK 1 PL			5
CMS-LN-B2-D	Foreign Language B2 - German as a Foreign Language		4 SWS SK 1 PL			5
CMS-LN-B2-FR	Foreign Language B2 - French		4 SWS SK 1 PL			5
CMS-LN-B2-I	Foreign Language B2 - Italian		4 SWS SK 1 PL			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-LN-B2-PG	Foreign Language B2 - Portuguese		4 SWS SK 1 PL			5
CMS-LN-B2-RU	Foreign Language B2 - Russian		4 SWS SK 1 PL			5
CMS-LN-B2-SP	Foreign Language B2 - Spanish		4 SWS SK 1 PL			5
CMS-LN-B2-SW	Foreign Language B2 - Swedish		4 SWS SK 1 PL			5
CMS-LN-B2-1D	Academic Competencies - B2 Advanced Level - German as a Foreign Language		4 SWS SK 1 PL			5
CMS-LN-B2-1F	Academic Competencies - B2 Advanced Level - French		4 SWS SK 1 PL			5
CMS-LN-B2-1RU	Academic Competencies - B2 Advanced Level - Russian		4 SWS SK 1 PL			5
CMS-LN-B2-1SP	Academic Competencies - B2 Advanced Level - Spanish		4 SWS SK 1 PL			5
CMS-LN-B2B-D	Professional Language Competencies - B2 Advanced Level - German as a Foreign Language		4 SWS SK 1 PL			5
CMS-LN-B2B-FR	Professional Language Competencies - B2 Advanced Level - French		4 SWS SK 1 PL			5
CMS-LN-B2B-RU	Professional Language Competencies - B2 Advanced Level - Russian		4 SWS SK 1 PL			5
CMS-LN-B2B-SP	Professional Language Competencies - B2 Advanced Level - Spanish		4 SWS SK 1 PL			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-LN-C1-D	Academic Competencies C1 - German as a Foreign Language		4 SWS SK 1 PL			5
CMS-LN-C1-FR	Academic Competencies C1 - French		4 SWS SK 1 PL			5
CMS-LN-C1-RU	Academic Competencies C1 - Russian		4 SWS SK 1 PL			5
CMS-LN-C1-SP	Academic Competencies C1 - Spanish		4 SWS SK 1 PL			5
CMS-LN-C1B-D	Professional Language Competencies C1 - German as a Foreign Language		4 SWS SK 1 PL			5
CMS-LN-C1B-F	Professional Language Competencies C1 - French		4 SWS SK 1 PL			5
CMS-LN-C1B-SP	Professional Language Competencies C1 - Spanish		4 SWS SK 1 PL			5
Basic Professional Training Select 3 out of 6 modules.						
CMS-COR-HPC	High-Performance Computing	2/2/0/0 1 credit				5
CMS-COR-ML	Machine Learning	2/2/0/0 1 PL				5
CMS-COR-NUM	Basic Numerical Methods	2/2/0/0 1 credit				5
CMS-COR-SAP	Stochastics and Probability	2/2/0/0 1 credit				5
CMS-COR-SSE	Scientific Software Engineering	2/2/0/0 1 credit				5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-COR-VIZ	Data Visualization	2/2/0/0 1 PL				5
Basic Training in Scientific Methodology Select 1 out of 13 modules.						
CMS-SEM-DLAIA	Literature Studies in Deep Learning for Applied Image Analysis		0/0/2/0 1 credit			3
CMS-SEM-CE	Literature Studies in Computational Engineering		0/0/2/0 1 credit			3
CMS-SEM-CGV	Literature Studies in Computer Graphics and Visualization		0/0/2/0 1 credit			3
CMS-SEM-CIA	Literature Studies in Combinatorial Image Analysis		0/0/2/0 1 credit			3
CMS-SEM-CLS	Literature Studies in Computational Life Science		0/0/2/0 1 credit			3
CMS-SEM-CM	Literature Studies in Computational Metrology		0/0/2/0 1 credit			3
CMS-SEM-CP	Literature Studies in Computing		0/0/2/0 1 credit			3
CMS-SEM-CV	Literature Studies in Computer Vision		0/0/2/0 1 PL			3
CMS-SEM-KGRL	Literature Studies on Knowledge Graph Representation Learning		0/0/2/0 1 credit			3
CMS-SEM-KR	Literature Studies in Knowledge Representation and Reasoning		0/0/2/0 1 PL			3
CMS-SEM-MB	Literature Studies in Mathematical Biology		0/0/2/0 1 credit			3

Module Number	Module name	1st Semester Lecture/Seminar/Practical/Project	2nd semester Lecture/Seminar/Practical/Project	3rd Semester (M) Lecture/Seminar/Practicum/Project	4th Semester Lecture/Seminar/Practicum/Project	LP
CMS-SEM-ML	Literature Studies in Machine Learning		0/0/2/0 1 credit			3
CMS-SEM-SP	Literature Studies on Software Methods and Technologies for Virtual Aircraft		0/0/2/0 1 PL			3
Tracks Selection of 1 out of 7 tracks.						
Applied Artificial Intelligence						
Required Course						
CMS-TRK-DCD	Digital Circuit Design	2/2/0/0 1PL				5
Elective Requirement						
Selection of modules totaling 35 credit points.						
CMS-TRK-CV	Computer Vision	2/2/0/0 1PL				5
CMS-TRK-MLSP	Machine Learning in Signal Processing	2/1/0/1 2 PL				5
CMS-TRK-APSS	Advanced Problem Solving and Search	2/2/0/0 1 credit				5
CMS-TRK-CAI	Conversational Artificial Intelligence	0/0/2/0 1 PL				5
CMS-TRK-FCG	Foundations of Computer Graphics	2/2/0/0 1 credit				5
CMS-TRK-DDA	Digitization and Data Analytics		2/2/0/0 1PL			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-AL	Adaptive Laser Systems		2/1/0/1 2 PL			5
CMS-TRK-CSD	Circuit and System Design		2/1/0/0 2 SWS Pj 1 PL			5
CMS-TRK-DNNH	Deep Neural Network Hardware		2/2/0/0 1PL			5
CMS-TRK-VR	Virtual Reality		2/0/0/0 20 hours of internship 1 PL			5
CMS-TRK-HWSWC	Hardware-Software Co-Design		2/2/0/0 1PL			5
CMS-TRK-AR-CCAM	Applied Robotics and Control for Cooperative and Autonomous Mobility		2/2/0/0 1PL			5
CMS-TRK-RL	Robot Learning		2/2/0/0 1 PL			5
CMS-TRK-SciVis	Scientific Visualization		2/2/0/0 1 PL			5
CMS-TRK-CRC	Computer- and Robot-Assisted Surgery			2/2/0/0 1 PL		5
CMS-TRK-SD	Sound Design			2/0/0/0 20 hours Pj 1 PL		5
CMS-TRK-CLS	Computational Laser Systems			3/1/0/0 1PL		5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-TSP	Touch Sensing and Processing			2/2/0/0 1 PL		5
CMS-TRK-TEA-CM	Team Assignment: Computational Metrology			8 SWS Pj 1 credit		10
CMS-TRK-DLVFA	Deep Learning for Vision - Foundations and Applications			2/2/0/0 1 credit		5
Choose 1 of 2 modules.						
CMS-TRK-TEA-MLCV	Team Assignment: Machine Learning and Computer Vision		8 SWS Pj 1 PL			10
CMS-TRK-TEA-AIH	Team Assignment: AI Hardware		8 SWS Pj 1 credit			10
Computational Engineering						
Required Courses						
CMS-TRK-CFD	Computational Fluid Dynamics	2/2/0/0 1 credit				5
CMS-TRK-MA31	Finite Element Methods - Theory, Implementation, and Applications	3/1/0/0 1 credit				5
CMS-TRK-AT	Advanced Topics in Finite Element Analysis		2/2/0/0 1 credit			5
CMS-TRK-MBD	Multi-Body Dynamics		2/2/0/0 1 PL			5
CMS-TRK-MP	Multifield Problems		2/2/0/0 1 PL			5
Elective Requirement						
Select 5 out of 18 modules.						

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-UI1	User Interface Engineering	2/2/0/0 2 PL				5
CMS-TRK-SysDyn	System Dynamics	2/2/0/0 1 PL				5
CMS-TRK-SysEng	Foundations of Systems Engineering	2/2/0/0 1 credit				5
CMS-TRK-APSS	Advanced Problem Solving and Search	2/2/0/0 1 PL				5
CMS-TRK-MA33	Scientific Programming – Advanced Concepts	3/1/0/0 1 PL				5
CMS-TRK-FCG	Foundations of Computer Graphics	2/2/0/0 1 credit				5
CMS-TRK-CLC	Closed-Loop Control in Networked Control Systems		2/2/0/0 1 PL			5
CMS-TRK-EMS	Electromechanical and microelectro-mechanical systems		2/2/0/0 2 PL			5
CMS-TRK-UI2	Advanced User Interfaces		2/0/2/0 2 PL			5
CMS-TRK-DDA	Digitization and Data Analytics		2/2/0/0 1 PL			5
CMS-TRK-IIV	Interactive Information Visualization		2/2/0/0 1 credit			5
CMS-TRK-PM	Particle Methods		2/2/0/0 1 PL			5
CMS-TRK-SciVis	Scientific Visualization		2/2/0/0 1 credit			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-Aero	Introduction to Computational Aerodynamics			3/1/0/0 1 credit		5
CMS-TRK-Sim	Practical Aspects of Simulation			2/0/0/2 1 credit		5
CMS-TRK-TSP	Touch Sensing and Processing			2/2/0/0 1 PL		5
CMS-TRK-CRC	Computer- and Robot-Assisted Surgery			2/2/0/0 1 PL		5
CMS-TRK-CV	Computer Vision			2/2/0/0 1 credit		5
Computational Environmental Science and Engineering						
Required Area						
CMS-TRK-TEA-CES	Computational Environmental Science Team Project			180 hours of clinical practice 1 PL		10
CMS-TRK-EA	Computational Environmental Applications			0/0/4/0 1 credit		5
Elective Requirement						
Select 2 out of 7 modules.						
CMS-TRK-ED4	Computational Statistics	2/1/0/0 1 credit				5
CMS-TRK-ED5	Geodata infrastructures	2/2/0/0 1 PL				5
CMS-TRK-ED1	Statistical Learning for Earth System Sciences		2/1/0/0 1 credit			5

Module Number	Module name	1st Semester Lecture/Seminar/Practical/Project	2nd semester Lecture/Seminar/Practical/Project	3rd Semester (M) Lecture/Seminar/Practicum/Project	4th Semester Lecture/Seminar/Practicum/Project	LP
CMS-TRK-ED2	Image Analysis and Machine Learning in Environmental Remote Sensing		2/1/0/0 1 PL			5
CMS-TRK-ED6	Retrieval of Land Surface Properties from Optical and Microwave Remote Sensing		0/0/2/0 1 PL			5
CMS-TRK-ED3	Applied Remote Sensing for Environmental Research			0/0/1/0 1 PL		5
CMS-TRK-CV	Computer Vision			2/2/0/0 1 PL		5
Select 2 out of 5 modules.						
CMS-TRK-EM1	Hydrological Modeling	2/2/0/0 1 PL				5
CMS-TRK-EM5	Individual-Based Ecology and Modeling	1/3/0/0 1 credit				5
CMS-TRK-EM2	Hydrological Modeling Practice		1/3/0/0 1 PL			5
CMS-TRK-EM3	Numerical Methods in Hydrosciences			2/2/0/0 1 credit		5
CMS-TRK-EM4	Advanced model evaluation			2/2/0/0 1 SWS T 1 PL		5
Selection of modules totaling 15 credit points.						
CMS-TRK-ES4	Environmental and Climate Remote Sensing	2/1/0/0 1 credit				5
CMS-TRK-ES7	Climatology and Hydrology	4/0/0/0 1 PL				5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-ES1	Climate Change		2/0/2/0 2 PL			5
CMS-TRK-ES2	Feedbacks between land surfaces and the atmosphere		2/1/0/0 1 PL			5
CMS-TRK-ES3	Geodetic Space Techniques for Climate Research		1/1/1/0 1 credit			5
CMS-TRK-ES6	Laser scanning and 3D point cloud processing		2/2/0/0 1 SWS Pj 1 PL			10
CMS-TRK-ES5	Recent Methods of Photogrammetric Geodata Acquisition			2/1/0/0 1 PL		5
Computational Life Sciences						
Required Area						
CMS-TRK-ABI	Applied Bioinformatics		2/2/0/0 1 PL			5
CMS-TRK-MOS	Modeling and Simulation in Biology		2/2/0/0 1 credit			5
CMS-TRK-TEA-CLS	Computational Life Science Team Project		8 SWS Pj 1 credit			10
Elective-Required Area						
Select 6 out of 24 modules.						
CMS-TRK-UI1	User Interface Engineering	2/2/0/0 2 PL				5
CMS-TRK-CFD	Computational Fluid Dynamics	2/2/0/0 1 credit				5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-FCG	Foundations of Computer Graphics	2/2/0/0 1 credit				5
CMS-TRK-DDA	Digitization and Data Analytics		2/2/0/0 1 PL			5
CMS-TRK-PM	Particle Methods		2/2/0/0 1 PL			5
CMS-TRK-ABP	Advanced Biological Physics		2/2/0/0 1 credit			5
CMS-TRK-SciVis	Scientific Visualization		2/2/0/0 1 credit			5
CMS-TRK-UI2	Advanced User Interfaces		2/0/2/0 2 PL			5
CMS-TRK-IIV	Interactive Information Visualization		2/2/0/0 1 credit			5
CMS-TRK-MP	Multifield Problems		2/2/0/0 1 PL			5
CMS-TRK-IMIR	Interactive Multimedia Information Retrieval		2/2/0/0 1 credit			5
CMS-TRK-AT	Advanced Topics in Finite Element Analysis		2/2/0/0 1 credit			5
CMS-TRK-MBD	Multi-Body Dynamics		2/2/0/0 1 PL			5
CMS-TRK-VR	Virtual Reality		2/0/0/0 20 hours of internship 1 PL			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-RL	Robot Learning		2/2/0/0 1 PL			5
CMS-TRK-GMA	Geometric Modeling and Animation		2/2/0/0 1 credit			5
CMS-TRK-CRC	Computer- and Robot-Assisted Surgery			2/2/0/0 1 PL		5
CMS-TRK-AMH	Active Matter Hydrodynamics			2/2/0/0 1 PL		5
CMS-TRK-CV	Computer Vision			2/2/0/0 1 credit		5
CMS-TRK-Aero	Introduction to Computational Aerodynamics			3/1/0/0 1 credit		5
CMS-TRK-APSS	Advanced Problem Solving and Search			2/2/0/0 1 credit		5
CMS-TRK-FVR	Foundations of Virtual Reality			2/2/0/0 1 credit		5
CMS-TRK-PBG	Physics-Based Graphics			2/2/0/0 1 PL		5
CMS-TRK-DLVFA	Deep Learning for Vision - Foundations and Applications			2/2/0/0 1 credit		5
Computational Mathematics						
Required Courses						
CMS-TRK-MA31	Finite Element Methods—Theory, Implementation, and Applications	3/1/0/0 1 credit				5
CMS-TRK-MA28	Numerical Methods for Partial Differential Equations - Basic Concepts	3/1/0/0 1 credit				5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-MAMS	Modeling Case Studies		0/0/4/0 6 SWS Pj 1 PL			10
CMS-TRK-MA32	Scientific Computing - Advanced Concepts		3/1/0/0 1 tablespoon			5
CMS-TRK-MA33	Scientific Programming - Advanced Concepts			3/1/0/0 1 credit		5
CMS-TRK-PRO-CMA	Computational Mathematics Research Work			0/0/2/0 2 SWS per year 1 PL		5
Elective Requirements						
Select 3 out of 8 modules.						
CMS-TRK-AMH	Active Matter Hydrodynamics	2/2/0/0 1 credit				5
CMS-TRK-CFD	Computational Fluid Dynamics	2/2/0/0 1 credit				5
CMS-TRK-IMB1	Introduction to Mathematical Biology I: Discrete Models	2/1/0/0 1 credit				5
CMS-TRK-MA29	Numerical Methods for Partial Differential Equations - Advanced Concepts		3/1/0/0 1 credit			5
CMS-TRK-MA30	Mathematical Methods in Continuum Mechanics		3/1/0/0 1 credit			5
CMS-TRK-ABP	Advanced Biological Physics		2/2/0/0 1 credit			5
CMS-TRK-IMB2	Introduction to Mathematical Biology II: Continuum Models			2/1/0/0 1 credit		5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-CV	Computer Vision			2/2/0/0 1 credit		5
Computational Modeling in Energy Economics						
Required Courses						
CMS-TRK-APSE	Applied Power System Economics	4 SWS Pj 1 credit				5
CMS-TRK-EPM	Electric Power Markets	2/2/0/0 1 PL				5
CMS-TRK-CSEE	Case Studies in Energy Economics		0/0/0.5/0 120 hours per year 2 PL			10
CMS-TRK-REEP	Resource Economics and Environmental Policy		2/2/0/0 2 SWS Pj 2 PL			10
Elective-Required Area						
Select 4 out of 8 modules.						
CMS-TRK-MA28	Numerical Methods for Partial Differential Equations - Basic Concepts	3/1/0/0 1 credit				5
CMS-TRK-LSEE	Literature Studies in Energy Economics		4 SWS per year 2 credit points			5
CMS-TRK-MA29	Numerical Methods for Partial Differential Equations – Advanced Concepts		3/1/0/0 1 credit			5
CMS-TRK-MA32	Scientific Computing - Advanced Concepts		3/1/0/0 1 credit			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Seminar/Practical/Project	Lecture/Seminar/Practical/Project	Lecture/Seminar/Practicum/Project	Lecture/Seminar/Practicum/Project	
CMS-TRK-OMEM	Optimization in Modern Electricity Markets		1/1/0/0 1 PL			5
CMS-TRK-MA31	Finite Element Methods—Theory, Implementation, and Applications			3/1/0/0 1 credit		5
CMS-TRK-APSS	Advanced Problem Solving and Search			2/2/0/0 1 credit		5
CMS-TRK-MA33	Scientific Programming - Advanced Concepts			3/1/0/0 1 credit		5
Visual Computing						
Required Courses						
CMS-TRK-TEA-VC	Visual Computing Team Project		8 SWS Pj 1 credit			10
Elective Requirements						
Select 8 out of 15 modules.						
CMS-TRK-CV	Computer Vision	2/2/0/0 1 PL				5
CMS-TRK-FCG	Foundations of Computer Graphics	2/2/0/0 1 credit				5
CMS-TRK-UI1	User Interface Engineering	2/2/0/0 2 PL				5
CMS-TRK-CAI	Conversational Artificial Intelligence	0/0/2/0 1 PL				5
CMS-TRK-GMA	Geometric Modeling and Animation		2/2/0/0 1 credit			5
CMS-TRK-SciVis	Scientific Visualization		2/2/0/0 1 credit			5

Module Number	Module name	1st Semester	2nd semester	3rd Semester (M)	4th Semester	LP
		Lecture/Semi-nar/Practi-cal/Project	Lecture/Semi-nar/Practi-cal/Project	Lecture/Semi-nar/Practi-cum/Project	Lecture/Semi-nar/Practi-cum/Project	
CMS-TRK-UI2	Advanced User Interfaces		2/0/2/0 2 PL			5
CMS-TRK-IIV	Interactive Information Visualization		2/2/0/0 1 credit			5
CMS-TRK-DDA	Digitization and Data Analytics		2/2/0/0 1 PL			5
CMS-TRK-IMIR	Interactive Multimedia Information Retrieval		2/2/0/0 1 credit			5
CMS-TRK-TSP	Touch Sensing and Processing			2/2/0/0 1 PL		5
CMS-TRK-PBG	Physics-Based Graphics			2/2/0/0 1 PL		5
CMS-TRK-FVR	Foundations of Virtual Reality			2/2/0/0 1 tablespoon		5
CMS-TRK-CRC	Computer- and Robot-Assisted Sur-gery			2/2/0/0 1 PL		5
CMS-TRK-DLVFA	Deep Learning for Vision - Foundations and Applications			2/2/0/0 1 credit		5
Master's Thesis*)				1 LP	28 LP	29
Colloquium					1 LP	1
LP		32	28	31	29	120