Please note that this English version of the study and examination regulations is nothing more than an aid to orientation. Solely the German version is legally binding.

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Study and Examination regulations of the Faculty of Mathematics and Informatics of Freie Universität Berlin for the module offering 30 credit points in informatics as adjuncts to other courses of study

Preamble

On the basis of § 14 Par. 1 No. 2 of the Partial Basic Regulations (Trial Model) of Freie Universität Berlin of 27 October 1998 (FU Announcements No. 24/1998), the Department Council of the Faculty of Mathematics and Informatics of Freie Universität Berlin on 19 April 2017 issued the following Study and Examination Regulations for the module offering 30 credit points in informatics as adjuncts to other courses of study.*

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Annexes

§ 1
Scope

These regulations stipulate the objective, contents and structure of the module offering 30 credit points in Informatics as part of other degree programs (module offering), and in supplementation to the framework study and examination regulations of Freie Universität Berlin (RSPO), requirements and procedures for examination performances (credit points) in the module offering.

* This regulation was confirmed by the Executive Board of the Freie Universität Berlin on 16 May 2017.

§ 2
Admission requirements

The admission requirement is admission to a bachelor's degree course with Freie Universität Berlin, the core subject of which does not exceed 150 credit points (CP), if its combinability with the module offering is not prevented via other regulations. Generally, the module offering can be combined with all study areas except for informatics and bioinformatics.

§ 3
Qualification objectives:

(1) Those who complete the module offering have knowledge of fundamental informatics-related terminology and methods, particularly the concepts of problems, specifications, models, algorithms, program designs, programming, testing, and proving.

(2) They can develop simple programs in a modern programming language, participate in development of larger programs, and also have fundamental abilities in assessing the effectiveness of specific informatics technologies for a stated purpose. They have developed fundamental skills in being able to develop informatics systems with these elements as well as adapt them, or are able to assess their socio-technological side-effects as well as the effects when these groups (diversity) are involved.

§ 4
Study contents

(1) The module offering covers fundamental language uses and the contexts of formal and social discourse regarding software. As part of the course, students cover basic informatics knowledge, particularly on modeling, design, programming, monitoring, and assessment processes, which makes them able to collaborate effectively within their chosen topic and the given technical, economic, and social framework conditions to search for informatics solutions.

(2) They also learn fundamental methods of systematically programming computers, as well as the use of fundamental technological components for practical implementation of theoretical concepts

§ 5
Student advisory and course advisory service

(1) The general student advisory service is provided by the Central Student Advisory and Psychological Advisory Office of Freie Universität Berlin.

(2) Course advice is provided by the professors that cover the courses in the module offering at the regular consultation times. In addition, at least one student assistant is also available in a consulting role.

(3) The Faculty also offers a student advisory service for female students; in such cases the contact is the

women's representative of the Faculty of Mathematics and Informations of Freie Universität Berlin.

§ 6
Examining Board

The examining board set up by the department council of the Faculty of Mathematics and Informatics at Freie Universität Berlin for the bachelor's degree program in Informatics from the Faculty of Mathematics and Informatics at Freie Universität Berlin is responsible for organizing examinations and for the other tasks stated as part of the RSPO.

§ 7
Structure and outline; scope of performance

(1) A total of 30 credit points must be earned as part of the module offering. The module offering is divided into a mandatory part with a scope of 16 CP and an elective part with a scope of 14 CP.

(2) The mandatory part includes the following modules:

– Module: Informatics A (8 CP) and

– Module: Informatics B (8 CP).

(3) Two modules with a total scope of 14 CP should be selected and completed within the elective part. The following modules are therefore offered:

– Module: Effects of informatics (7 CP),

– Module: Database systems for auxiliary subject (7 CP),

– Module: Fundamentals of Theoretical Computer Science for auxiliary subject (7 CP),

– Module: Non-sequential programming (7 CP).

– Module: Distributed programming (7 CP).

(4) The module descriptions in Annex 1 provide information regarding admission requirements, contents and qualification objectives, forms of teaching and learning, time requirements, forms of active participation, examination work required alongside studies, obligations regarding regular participation in the forms of teaching and learning, credit points assigned to the relevant modules, normal duration, and frequency of offering.

(5) The examples of courses of study in module offerings in Annex 2 provide information on the recommended study sequence.

§ 8
Forms of teaching and learning

(1) The following forms of teaching and learning are part of course offerings:

1. Lecture (L): Lectures provide a systematic and wide-ranging overview of the wider scope of informatics, as well as its methodological or theoretical fundamentals in a specific subject area, therefore acting as an illustration of overall contexts and theoretical bases. Lectures from the relevant instructor are the primary form of teaching. They monitor the state of knowledge at the end of the course.
2. Exercise (E): Exercises take place in small groups as an accompaniment to lectures, where these groups should not contain more than twenty participants. The exercises are carried out by student assistants, or research assistants under the supervision of the instructor for the relevant lecture. Exercise sheets with theoretical or practical tasks appear at regular intervals regarding a lecture, and these should be done by students independently as homework or in small groups that are organized by the students themselves. The solutions, or approaches to solving the problems, are stated in workgroups and then discussed. The purpose of workgroups is to deepen knowledge of the material covered in the lecture, as well as learning and practicing methods and techniques. In addition, the discussion should cover informatics, collaboration, and planning own work processes.
3. Seminar (S): A seminar is used to impart knowledge of a distinct subject area and to acquire skills, independently answer a question, illustrate the results and to discuss these critically. The major lesson types are seminar discussions based on teaching materials, on lectures that are to be prepared (specialist literature and sources), on assignments, as well as group work.

(2) The forms of teaching and learning in line with Par. 1 can be used in blended learning arrangements. The on-campus studies are linked with electronic Internet-based media (e-learning). In this case, selected teaching and learning activities are offered via the central e-learning applications of the Freie Universität Berlin and either carried out by students independently on their own or in a group, and/or with other support. Blended learning can be used in the execution phase (exchange and discussion of learning objects, solving tasks, intensification of communication between learner and instructor), or in the follow-up phase (monitoring learning outcomes, transfer support).

§ 9
Repetition of examinations

(1) In case of failure, examinations may be repeated up to three times.

(2) If the first potential examination date is directly after the end of the associated course then an examination performance graded as "sufficient" (4.0) or better in the module may be repeated once for the purpose of improving a grade, which takes place by the beginning of the subsequent semester at the very latest. The better grade will be taken into account. An improvement in the grade is not possible in case of a

repeated exam.

§ 10
Electronic examinations

(1) In the case of electronic examinations, performance and evaluation is carried out with digital technologies.

(2) Before an examination where digital technologies are used, the suitability of such technologies with regard to the intended examination tasks, and performance of the electronic examination, should be verified beforehand by two examiners.

(3) The authenticity of the author and the integrity of examination results should be safeguarded. The examination results, in the form of electronic data, are clearly identified to this effect and also unmistakably and permanently assigned to the student. It should be ensured that electronic data remains unchanged and complete for assessment and for verifiability.

(4) An automatically generated assessment of examination performance should be checked by an examiner if requested by the student in question.

§ 11
Entry into force

These regulations come into force on the day following their publication in the Official Gazette of the Freie Universität Berlin (FU Announcements).

Annex 1: Module descriptions

Explanations:

The following module descriptions state the following for each module:

- Designation of module
- Those who are responsible for the module,
- Requirements for admission to each module,
- Content and qualification objectives of module
- Teaching and learning forms of module
- Estimated student effort requirement to complete the module
- Forms of active participation
- the examination forms
- mandatory regular participation
- the credit points assigned to the modules
- Normal duration of module
- Frequency of course offering
- Applicability of the module

The information on time requirements refer in particular to

- Active participation in on-campus study period
- Time required for completion of minor tasks related to on-campus study period
- Time for independent preparation and follow-up
- Processing of study units in online study phases
- Preparation time immediately prior to examinations
- Examination time.

The information on time requirements for self-study (including preparation and follow-up, examination preparations, etc.) are guideline values to help students organize the time required for module-related work. The information on work effort requirements corresponds to the number of credit points assigned to each module as the unit of measure for student work effort as an approximation of the work required to complete the module successfully. A credit point is equivalent to 30 hours.

To the extent the required study performance includes regular participation, this is established, as well as active participation in the teaching and learning forms and successful completion of the examination requirements of each module, as a precondition for acquiring the credit points assigned to the respective module. Regular participation compliance is when 75 % of the on-campus study time scheduled in the teaching and learning forms of a module were attended. Even if there is no mandatory regular participation in a type of learning for a module, it is strongly recommended nonetheless. The relevant instructor cannot establish compulsory presence for types of learning for where participation is merely recommended.

Module exams - if assigned - must be taken for each module. Graded modules are completed with only one examination (module exam). The module exam must reflect the qualification objectives of the module. It tests whether the objectives of the module have been reached based on an exemplary sampling. The scope of the examination is limited to what is required to achieve this. In modules for which alternative examination forms are planned, the examination form for each semester must be determined by the responsible instructor by the first course date at the latest.

Active and - if provided - regular participation in the teaching and learning forms as well as successful completion of the examination requirements of each module, are the preconditions for acquiring the credit points assigned to each module. In modules with no module examination, active participation as well as regular participation in the teaching and learning forms are the preconditions for acquiring the credit points assigned to each module.

Module: Informatics A

University/Faculty: Freie Universität Berlin/Mathematics and Informatics

Persons responsible for module: Module Instructors

Admission requirements: None

Qualification objectives:

Students are able to

- formally specify functional programs
- develop well-structured, functional programs and demonstrate characteristics of recursive programs with full induction
- illustrate atomic data types (digits, characters) in an internal computer format and apply elementary operations on top of it
- implement and use algebraic data types such as tuples, lists, trees
- implement logical expressions in combinatorial circuits
- implement finite automata in combinatorial circuits, and
- describe the components of an ALU.

They have a fundamental understanding of predictability.

Contents:

Initially the term of the algorithm and the path from the problem to the program via the algorithmic solution are the primary focus. Fundamental principles of designing algorithms are explained, and understanding of recursion is developed based on numerous examples (e.g. sorting and searching). Implementation of the algorithms is connected with introduction of a suitable programming language. The theoretical, technical, and organizational foundations of computer systems are also introduced. In this case, the topics of binary illustration of information in computers, Boolean functions and calculation thereof via combinatorial circuits, sequential circuits for building processors and von Neumann architecture.

Forms of teaching and learning	**On-campus studies** (hours per semester week = SWH)	**Forms of active participation**	**Work effort** (hours)	
Lecture	4	–	On-campus time L	60
Exercise	2	– written work on assigned exercise sheets – oral presentations regarding the solution to a task in the exercise	Preparation and follow-up L	60
			On-campus time E	30
			Preparation and follow-up E	60
			Examination preparation and Examination	30

Module exam:	Written exam (90 minutes), the written exam can also be carried out in the form of an electronic examination.	
Module language:	German	
Mandatory regular participation:	Lecture: Participation recommended, exercise: Yes	
Total working time requirement:	240 hours	8 CP
Duration of module:	One semester	
Frequency of course offering:	Each winter semester	
Applicability:	Informatics module worth 30 CP; bachelor's degree course in bioinformatics	

Module: Informatics B

University/Faculty: Freie Universität Berlin/Mathematics and Informatics

Persons responsible for module: Module Instructors

Admission requirements: None

Qualification objectives:

Students are able to

- model in an object-oriented manner and use theoretical graph concepts as a tool in algorithmic tasks
- design algorithmic solutions, using various design paradigms in this case, and also assess the algorithms with regard to their correctness and efficiency
- specify abstract data types, implement them in various ways, and therefore analyze efficiency
- develop and test well-structured, imperative programs.

Contents:

Fundamentals of both imperative and object-oriented programming are covered. Programming takes place in either Java and/or Python. Various design paradigms for algorithms (such as divide & rule, greedy, dynamic programming, backtracking) are introduced in connection with fundamental graph theoretical algorithms. This is linked with efficiency analysis of the algorithms. In addition, the pattern and efficient manipulation of data structures (stack, queue, heap, dictionary) are covered.

Forms of teaching and learning	**On-campus studies** (hours per semester week = SWH)	**Forms of active participation**	**Work effort** (hours)	
Lecture	4	–	On-campus time L	60
Exercise	2	– written work on assigned exercise sheets – oral presentations regarding the solution to a task in the exercise	Preparation and follow-up L	60
			On-campus time E	30
			Preparation and follow-up E	60
			Examination preparation and Examination	30

Module exam:	Written exam (90 minutes), the written exam can also be carried out in the form of an electronic examination.	
Module language:	German	
Mandatory regular participation:	Lecture: Participation recommended; exercise: Yes	
Total working time requirement:	240 hours	8 CP
Duration of module:	One semester	
Frequency of course offering:	Each summer semester	
Applicability:	Informatics module worth 30 CP; bachelor's degree course in bioinformatics	

Module: Effects of informatics

University/Faculty: Freie Universität Berlin/Mathematics and Informatics

Persons responsible for module: Module Instructors

Admission requirements: None

Qualification objectives:

Students

– understand the difference between stock knowledge and orientative knowledge,

– learn how to distinguish between technical questions, technological assessment, and technological impact assessment when thinking about informatics systems,

– understand the responsibility aspects of engineering activities,

– learn several aspects of technological assessment in specific informatics-related fields such as security, protection of privacy,

– understand diversity aspects of applications and in application development.

Contents:

This module covers the effects of the use of informatics systems. After fundamental questions (concept, stock knowledge, concept of responsibility, subjectivity of technological sociology) the consequences of technology in sustainable informatics areas are specifically covered with examples, e.g. the security of software-intensive technical systems, protection of the private sphere, or the effects of computerization of the working environment.

Forms of teaching and learning	**On-campus studies** (hours per semester week = SWH)	**Forms of active participation**	**Work effort** (hours)	
Lecture	2	–		
Seminar	2	– written work on work assignments – oral presentations of the solution, each for a task in the seminar	On-campus time L Preparation and follow-up L On-campus time E Preparation and follow-up E	30 60 30 90

Module exam:	None	
Module language:	German	
Mandatory regular participation:	Lecture: Participation recommended; exercise: Yes	
Total working time requirement:	210 hours	7 CP
Duration of module:	One semester	
Frequency of course offering:	Block course after the lecturing period every winter semester	
Applicability:	Informatics module worth 30 CP	

Module: Database systems for auxiliary subject

University/Faculty: Freie Universität Berlin/Mathematics and Informatics

Persons responsible for module: Module Instructors

Admission requirements: None

Qualification objectives:

Students can explain the purpose and structure of a database, create database models (such as ER models) from application descriptions, derive a relational model from a database schema, create a database based on a relational model, and formalize an inquiry in relational algebra. They can explain the motivation for normalizing data and can apply algorithms for normalizing data.

Contents:

Database design with entity-relationship models and UML; theoretical basics of relational database systems, relational algebra; functional dependencies, normal forms, relational database development: Data definition, foreign keys, other integrity conditions, object-relational mapping, transaction concept.

Forms of teaching and learning	**On-campus studies** (hours per semester week = SWH)	**Forms of active participation**	**Work effort** (hours)	
Lecture	2	–	On-campus time L	30
Exercise	1	– written work on assigned exercise sheets – oral presentations regarding the solution to a task in the exercise	Preparation and follow-up L	60
			On-campus time E	15
			Preparation and follow-up E	60
			Examination preparation and Examination	45

Module exam:	Written exam (90 minutes), the written exam can also be carried out in the form of an electronic examination.	
Module language:	German	
Mandatory regular participation:	Lecture: Participation recommended; exercise: Yes	
Total working time requirement:	210 hours	7 CP
Duration of module:	One semester	
Frequency of course offering:	Each summer semester	
Applicability:	Informatics module worth 30 CP	

Module: Fundamentals of Theoretical Computer Science for auxiliary subject

University/Faculty: Freie Universität Berlin/Mathematics and Informatics

Persons responsible for module: Module Instructors

Admission requirements: None

Qualification objectives:

Students understand the fundamentals of describing programming languages. They master current procedures to transform formal languages from one description form into another, as well as how to compile descriptions in minimal forms. They can derive the intended language from a description. They understand that different description forms of calculation forms are equivalent and understand the processes to transform one form into another. They understand the main options and limits of predictability In particular, they understand the halting problem and how it cannot be solved.

Contents:

Theoretical calculation models: (automata, Turing machines), formal languages, language acceptors, regular expressions, predictability.

Forms of teaching and learning	**On-campus studies** (hours per semester week = SWH)	**Forms of active participation**	**Work effort** (hours)	
Lecture	2	–	On-campus time L	30
Exercise	1	– written work on assigned exercise sheets – oral presentations regarding the solution to a task in the exercise	Preparation and follow-up L	60
			On-campus time E	15
			Preparation and follow-up E	60
			Examination preparation and Examination	45

Module exam:	Written exam (90 minutes), the written exam can also be carried out in the form of an electronic examination.	
Module language:	German	
Mandatory regular participation:	Lecture: Participation recommended; exercise: Yes	
Total working time requirement:	210 hours	7 CP
Duration of module:	One semester	
Frequency of course offering:	Each summer semester	
Applicability:	Informatics module worth 30 CP	

Module: Non-sequential programming

University/Faculty: Freie Universität Berlin/Mathematics and Informatics

Persons responsible for module: Module Instructors

Admission requirements: None

Qualification objectives:

Students understand the basic terms of non-sequential programming with a joint memory. They can appropriately structure non-sequential programs with processes, threads, and active objects and also avoid unwanted non-deterministic effects and deadlocks via suitable synchronization processes. They are aware of and understand security risks that may occur in non-sequential programming and can use methods to avoid these. They can formally specify the features of processes and threads and verify these using examples.

Contents:

Programming and synchronization of simultaneously running processes that access the same memory.

– Non-sequential programming and processes in its various formats

– Non-determinism, determinism

– Synchronization mechanisms: Locks, monitors, guards, events, semaphores

– Non-sequential programming and object orientation
Sequence control, selection strategies, priorities, handling and avoiding deadlocks

– Coroutines, implementation, multi-processor systems

Forms of teaching and learning	**On-campus studies** (hours per semester week = SWH)	**Forms of active participation**	**Work effort** (hours)	
Lecture	2	–	On-campus time L	30
Exercise	1	– written work on assigned exercise sheets – oral presentations regarding the solution to a task in the exercise	Preparation and follow-up L	60
			On-campus time E	15
			Preparation and follow-up E	60
			Examination preparation and Examination	45

Module exam:	Written exam (90 minutes), the written exam can also be carried out in the form of an electronic examination.	
Module language:	German	
Mandatory regular participation:	Lecture: Participation recommended; exercise: Yes	
Total working time requirement:	210 hours	7 CP
Duration of module:	One semester	
Frequency of course offering:	Each summer semester	
Applicability:	Informatics module worth 30 CP	

Module: Distributed programming

University/Faculty: Freie Universität Berlin/Mathematics and Informatics

Persons responsible for module: Module Instructors

Admission requirements: None

Qualification objectives:

Students understand the basic terms of distributed programming with interaction with each other. They can distinguish between relevant interaction paradigms such as client/server and peer-to-peer, classify own applications appropriately in line with these paradigms, and construct distributed systems based on remote calls. They can appropriately design, structure, and realize web applications and client/service provider applications, as well as develop distributed systems with the aid of suitable middleware.

Contents:

– Interaction via messages
– Programming and synchronization of simultaneously running processes that interact with each other.
– Remote call technologies
– Client-server, peer-to-peer
– Parallel computing within the network
– Coordination languages, orchestration, choreography
– Processing on the server and the client, mobility
– Middleware, structured communication, static and dynamic interfaces
– Event-based and stream-based processing
– Security of applications in network, securing protocols
– Non-functional features (time, memory, quality of service)

Forms of teaching and learning	**On-campus studies** (hours per semester week = SWH)	**Forms of active participation**	**Work effort** (hours)	
Lecture	2	–	On-campus time L	30
Exercise	1	– written work on assigned exercise sheets – oral presentations regarding the solution to a task in the exercise	Preparation and follow-up L	60
			On-campus time E	15
			Preparation and follow-up E	60
			Examination preparation and Examination	45

Module exam:	Written exam (90 minutes), the written exam can also be carried out in the form of an electronic examination.	
Module language:	German	
Mandatory regular participation:	Lecture: Participation recommended; exercise: Yes	
Total working time requirement:	210 hours	7 CP
Duration of module:	One semester	
Frequency of course offering:	Each summer semester	
Applicability:	Informatics module worth 30 CP	

Annex 2: Examples of courses of study for the module offering 30 credit points in Informatics as part of other bachelor degree programs offered by Freie Universität Berlin

Variant 1:

Semester	Module	30 CP
1. FS	Informatics A	8 CP
2. FS	Informatics B	8 CP
3. FS	Mandatory module	7 CP
4. FS		
5. FS	Mandatory module	7 CP
6. FS		

Variant 2:*

Semester	Module	30 CP
1. FS		
2. FS		
3. FS	Informatics A	8 CP
4. FS	Informatics B	8 CP
5. FS	Mandatory module	7 CP
6. FS	Mandatory module	7 CP

Variant 3:*

Semester	Module	30 CP
1. FS	Informatics A	8 CP
2. FS		
3. FS		
4. FS	Informatics B	8 CP
5. FS	Mandatory module	7 CP
6. FS	Mandatory module	7 CP

* The variants shown (additional variants are possible) can be used to appropriately balance the total study load for every semester in connection with the other degree programs. It is recommended that course advice is sought.

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