

Computer Science

Bachelor of Science (B.Sc.)

Fb 2: Informatik und Ingenieurwissenschaften –
Computer Science and Engineering

Fachhochschule Frankfurt am Main
- University of Applied Sciences
Nibelungenplatz 1
60318 Frankfurt am Main

Prüfungsordnung des Fachbereichs 2: Informatik und Ingenieurwissenschaften der Fachhochschule Frankfurt am Main – University of Applied Sciences für den Bachelor-Studiengang Computer Science vom 04.06.2014.

Aufgrund des § 44 Abs. 1 Nr. 1 des Hessischen Hochschulgesetzes (HHG) vom 14. Dezember 2009 hat der Fachbereichsrat des Fachbereichs 2: Informatik und Ingenieurwissenschaften der Fachhochschule Frankfurt am Main – University of Applied Sciences am 04.06.2014, die nachstehende Prüfungsordnung für den Studiengang Computer Science beschlossen. Die Prüfungsordnung entspricht den Allgemeinen Bestimmungen für Prüfungsordnungen mit den Abschlüssen Bachelor und Master an der Fachhochschule Frankfurt am Main – University of Applied Sciences (AB Bachelor/Master) vom 10. November 2004 (Staatsanzeiger für das Land Hessen 2005 S. 519), zuletzt geändert am 16. Oktober 2013 (veröffentlicht am 25.11.2013 auf der Internetseite in den amtlichen Mitteilungen der Fachhochschule Frankfurt am Main – University of Applied Sciences) und ergänzt sie. Die Prüfungsordnung wurde durch das Präsidium am 29. September 2014 gemäß § 37 Abs. 5 HHG genehmigt.

Vorbemerkung

Die Studierenden des englischsprachigen Bachelor-Studiengangs „Computer Science“ (CS) sind an der „Vietnamese German University“ (VGU) und der Fachhochschule Frankfurt am Main – University of Applied Sciences (FH FFM) reguläre Studierende. Die Struktur des sechssemestrigen Studiengangs Computer Science entspricht hierbei im Wesentlichen dem deutschsprachigen Bachelor-Studiengang „Informatik“ der FH FFM.

Die vietnamesischen Studierenden werden zunächst von der VGU zugelassen und eingeschrieben. Sie durchlaufen dann ein zweisemestriges „Foundation-Year“ (FY), eine Art Studienkolleg, in dem sie auf den eigentlichen Studiengang Computer Science vorbereitet werden und ein Praktikum durchführen. Nach erfolgreichem Abschluss des FY's können sich die Studierenden der VGU in den Studiengang Computer Science der FH FFM einschreiben. Näheres ist in dieser Prüfungsordnung geregelt. Die Veranstaltungen des Studiengangs werden an der VGU in Ho Chi Minh City, Vietnam, durchgeführt. Der Unterricht wird sowohl von vietnamesischen als auch von deutschen Lehrenden erteilt. Für die Durchführung der Lehrveranstaltungen ist die FH FFM zuständig. Die geforderten Prüfungsleistungen werden nach den Regeln dieser Prüfungsordnung erbracht. Die VGU stellt die notwendige Infrastruktur zur Durchführung der Lehrveranstaltungen zur Verfügung. Die FH FFM erteilt das Zeugnis und verleiht die Bachelor-Urkunde mit dem akademischen Grad „Bachelor of Science“ (B. Sc.).

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§ 1 Akademischer Grad

Nach der bestandenen Bachelorprüfung verleiht die Fachhochschule Frankfurt am Main – University of Applied Sciences den akademischen Grad Bachelor of Science (B.Sc.).

§ 2 Regelstudienzeit

- (1) Die Regelstudienzeit beträgt 6 Semester.
- (2) Das gesamte Studium umfasst 180 ECTS-Punkte (Credits).

§ 3 Zulassungsvoraussetzungen

In den Studiengang kann eingeschrieben werden, wer an der „Vietnamese German University“ das „Foundation Year“ erfolgreich absolviert hat.

§ 4 Module

- (1) Der Studiengang umfasst 28 Module. Die Inhalte der Module, die Anzahl der jeweiligen ECTS-Punkte (Credits) sowie die jeweiligen Prüfungsleistungen ergeben sich aus den Modulbeschreibungen (Anlage 3).
- (2) Die Voraussetzungen für die Zulassung zu einer Modulprüfung sind in der jeweiligen Modulbeschreibung geregelt (Anlage 3).
- (3) Die Module werden in englischer Sprache erbracht, das heißt alle Lehrveranstaltungen und die Modulprüfungen werden in englischer Sprache durchgeführt.
- (4) Für das Modul M25 wählt die Studierende oder der Studierende ein Wahlpflichtmodul (M25.1, M25.2, M25.3 oder M25.4) aus. Das Angebot an Wahlpflichtmodulen kann Änderungen aufgrund der Aktualisierung des wissenschaftlichen Erkenntnisstandes und der Lehr- und Forschungsschwerpunkte der Lehrenden unterliegen. Der Fachbereichsrat beschließt und veröffentlicht für jedes Semester eine aktuelle Liste von Wahlpflichtangeboten für das Modul M25. Diese Liste wird spätestens 4 Wochen vor Vorlesungsbeginn per Aushang veröffentlicht.

§ 5 Prüfungsleistungen

- (1) Die Art der Modulprüfungsleistung oder Modulteilprüfungsleistung ist in der jeweiligen Modulbeschreibung geregelt.
- (2) Die Bearbeitungszeit einer schriftlichen Prüfungsleistung in Form von Klausurarbeiten beträgt mindestens 90 Minuten und höchstens 180 Minuten. Die Dauer der schriftlichen Prüfungsleistungen in den einzelnen Modulen ist in den Modulbeschreibungen geregelt (Anlage 3).

§ 6

Wiederholbarkeit von Prüfungsleistungen

- (1) Nicht bestandene Modulprüfungsleistungen oder Modulteilprüfungsleistungen für die Module M1 bis M27 können zweimal wiederholt werden.
- (2) Das Modul M28 Bachelor-Arbeit mit Kolloquium kann nur einmal wiederholt werden.
- (3) Bestandene Modulprüfungsleistungen und Modulteilprüfungsleistungen können nicht wiederholt werden.

§ 7 Praxisphase

- (1) Das Studium beinhaltet eine Praxisphase von 14 Wochen.
- (2) Für die Praxisphase werden insgesamt 18 ECTS-Punkte (Credits) vergeben. Die Form der Leistungsnachweise in der Praxisphase ist in der Beschreibung zu Modul M27: Praxisphase geregelt.
- (3) Näheres regelt die Praxisphasenordnung des Fachbereich 2 – Informatik und Ingenieurwissenschaften.

§ 8 Bachelor-Arbeit mit Kolloquium

- (1) Die Bachelor-Arbeit mit Kolloquium umfasst 12 ECTS-Punkte (Credits). Die Zeit von der Ausgabe des Themas zur Bachelor Arbeit bis zur Abgabe der Bachelor-Arbeit beträgt 9 Wochen.
- (2) Für die Zulassung zur Bachelor-Arbeit müssen die Module M1 bis einschließlich M26 erfolgreich abgeschlossen sein. Außerdem muss der Beginn des Moduls M27 Praxisphase durch Vorlage eines unterzeichneten Ausbildungsvertrages nachgewiesen werden.
- (3) Die Bachelor-Arbeit ist in schriftlicher Form fristgerecht beim Prüfungsamt des Fachbereichs 2 in zwei gebundenen Ausfertigungen einzureichen und in elektronischer Form abzugeben. Teile der Bachelor-Arbeit, die als Quellprogrammdateien oder ausführbare Dateien oder sonstige Dateien vorliegen, sind auf einem zeitgemäßen Medium beizufügen. Das Abgabedatum wird aktenkundig gemacht.
- (4) Kann der erste Abgabetermin aus Gründen, welche die Studierende oder der Studierende nicht zu vertreten hat, nicht eingehalten werden, so wird die Bearbeitungszeit nach Maßgabe des §25 Abs. 8 S. 1 AB Bachelor/Master um die Zeit der Verhinderung, längstens jedoch um einen Monat verlängert.
- (5) Bei unterschiedlicher Bewertung der Bachelor-Arbeit wird von der Vorsitzenden oder dem Vorsitzenden des Prüfungsausschusses die Note aus dem arithmetischen Mittel der Einzelnoten gebildet. Der Prüfungsausschuss holt die Stellungnahme einer dritten Prüferin oder eines dritten Prüfers ein, wenn die Beurteilungen der Prüfenden um mehr als 2,0 voneinander abweichen oder wenn eine oder einer der Prüfenden die Bachelor-Arbeit als "nicht ausreichend" beurteilt. Die Note wird in diesem Fall aus den Noten der Erstprüferin oder des Erstprüfers, der Zweitprüferin oder des Zweitprüfers und der Drittprüferin oder des Drittprüfers aus dem arithmetischen Mittel der Einzelnoten gebildet.

- (6) Die Bachelor-Arbeit ist im Rahmen eines Bachelor-Kolloquiums vorzustellen. Das Kolloquium setzt das Bestehen der Bachelor-Arbeit voraus und findet vor zwei Prüferinnen oder Prüfern statt. Das Bachelor-Kolloquium findet innerhalb von 4 Wochen nach Abgabe der Bachelorarbeit statt. Die Dauer des Kolloquiums beträgt mindestens 30 Minuten und maximal 60 Minuten.
- (7) Die Note des Moduls Bachelor-Arbeit setzt sich aus den Noten der Bachelor-Arbeit und des Bachelor-Kolloquiums im Verhältnis 8:2 zusammen.

§ 9

Bildung der Gesamtnote

- (1) Für das Bachelor-Zeugnis wird eine Gesamtnote gebildet. Die Gesamtnote der Bachelor-Prüfung errechnet sich aus der Summe der Produkte der Noten der einzelnen Module M1 bis M28 mit ihren Gewichtungsfaktoren gemäß der Modulübersicht (Anlage 2).
- (2) Für die Gesamtnote wird ein ECTS-Rang vergeben.

§ 10

Zeugnis, Urkunde und Diploma Supplement

- (1) Nach bestandener Bachelor-Prüfung erhält die Studierende oder der Studierende ein Zeugnis, die Bachelor-Urkunde und ein Diploma Supplement nach Maßgabe des § 23 der AB Bachelor/Master.
- (2) Auf Antrag der Studierenden oder des Studierenden ist das Ergebnis der Prüfungen in Zusatzmodulen in das Zeugnis aufzunehmen.

§ 11

Inkrafttreten

Diese Prüfungsordnung tritt am 01.09.2014 zum Wintersemester 2014/2015 in Kraft und wird auf einem zentralen Verzeichnis (Amtliche Mitteilungen) auf der Internetseite der Fachhochschule Frankfurt am Main veröffentlicht.

Frankfurt am Main, _____

Prof. Achim Morkramer
Dekan des Fachbereichs 2:
Informatik und Ingenieurwissenschaften – Computer Science and Engineering
Frankfurt University of Applied Sciences

Prüfungsordnung zum Bachelor-Studiengang Computer Science

Modulübersicht Computer Science

- Anlage 2 zur Prüfungsordnung -

(Semester – Module – ECTS – Dauer – Lehrform – Prüfungsform – Sprache d. Moduls – SWS)

Se m.	Modultitel	ECT S	Dauer [Sem]	Lehrformen	Prüfungsform	Sprache	SWS	Gewich- tung
1	M1 Algebra	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	6	1/48
1	M2 Calculus	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	6	1/48
1	M3 Introduction to Computer Science	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	4	1/48
1 + 2	M4 Introduction to Programming	15	2	Vorlesung, Übung	Zwei Teilprüfungsleistu- ngen: 2 Klausuren am Rechner je 120 Minuten	Englisch	8	1/16
1	M5 Business Administration	5	1	Vorlesung	Klausur 90 Minuten	Englisch	4	1/48
1 + 2	M6 English	5	2	Übung	Klausur 90 Minuten	Englisch	5	1/48
2	M7 Discrete Mathematics	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	6	1/48
2	M8 Computer Architectures	5	1	Vorlesung, Übung	Klausur am Rechner 120 Minuten	Englisch	4	1/48
2	M9 Algorithms and Data Structures	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	6	1/48
2	M10 Theoretical Computer Science, Automata and Formal Language Theory	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	4	1/48
3	M11 Software Engineering – Analysis	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	4	1/36
3	M12 Statistics	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	4	1/36
3	M13 Object-oriented Programming with Java – Advanced Course	5	1	Vorlesung, Übung	Projektarbeit	Englisch	4	1/36

3	M14 Databases	5	1	Vorlesung, Übung	Klausur 120 Minuten	Englisch	6	1/36
3	M15 Computer Networks	10	1	Vorlesung, Übung, Lab.	Klausur 90 Minuten	Englisch	6	1/18
4	M16 Operating Systems	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	4	1/36
4	M17 Software Engineering – Design	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	4	1/36
4	M18 Realtime Systems	5	1	Vorlesung, Labor	Klausur 90 Minuten	Englisch	4	1/36
4	M19 IT Security	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	4	1/36
4	M20 Distributed Systems	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	6	1/36
4	M21 Programming Exercises	5	1	Projekt	Projektarbeit	Englisch	4	1/36
5	M22 Law and Data Protection	5	1	Vorlesung, Übung	Klausur 90 Minuten	Englisch	4	5/144
5	M23 Current topics in Computer Science	5	1	Vorlesung, Seminar	Schriftliche Ausarbeitung, Präsentation, Klausur	Englisch	4	5/144
5	M24 Project	10	1	Projekt	Projektarbeit	Englisch	8	10/144
5	M25.1 Human Machine Interfaces	5	1	Vorlesung, Übung	Projektarbeit	Englisch	4	5/144
5	M25.2 Data Mining and pers. Medicine	5	1	Vorlesung, Seminar	mündliche Prüfung	Englisch	4	5/144
5	M25.3 Embedded Systems & Mobile Devices	5	1	Vorlesung, Labor	Klausur 90 Minuten	Englisch	4	5/144
5	M25.4 Medical Image Processing	5	1	Vorlesung, Labor	Mündliche Prüfung	Englisch	4	5/144
5	M26 Studium Generale	5	1	variabel	Variabel, je nach Modulexemplar	Englisch	varia bel	5/144
6	M27 Practical Training Phase	18	1	Berufspraxis	Bericht, Präsentation	Englisch	2	10/144
6	M28 Bachelor Thesis with Colloquium	12	1	Selbstständig es Arbeiten	Bachelor-Arbeit, Kolloquium	Englisch	2	20/144

Modulbeschreibungen Computer Science - Anlage 3 zur Prüfungsordnung

Module Description for Module 1: Algebra

Module title	Algebra
Module number	M1
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	1
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>The students acquire knowledge of the structural and logic basics of electronic information processing.</p> <p>They are to be acquainted with abstract mathematical terms.</p> <p>The students have the ability to independently develop abstract concepts and to acquire basic techniques or processes</p> <p>They are acquainted with the essential concepts, structures and methods of basic algebra and linear algebra. In particular, they are well-acquainted with basic algebraic structures necessary for the comprehension of formal structures in Computer Science and they are proficient in handling them.</p> <p>The following extracurricular skills are acquired: analytical thinking, development of methodological expertise, handling abstract methods, structures and models.</p>
Contents of the module	<p>Lecture Algebra</p> <p>Exercise Algebra</p>
Teaching methods of the module	Lectures and exercises
Total workload	150 h (5% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

Module Description for Module 2: Calculus

Module title	Calculus
Module number	M2
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	1
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>The students are acquainted with the most important concepts, processes and techniques in differential and integral calculus. Thereby, the understanding of specific methods of analysis is predominant.</p> <p>The students have the ability to implement simple application problems into mathematical formulations and to solve them. Thereby, they fully understand the requirements and limits of differential and integral calculus methods.</p> <p>The following extracurricular skills are acquired: analytical thinking, development of methodological expertise, handling abstract methods, structures and models, the abstract implementation of practical application problems into formal models is enhanced.</p>
Contents of the module	Lecture Analysis Exercise Analysis
Teaching methods of the module	Lectures and exercise
Total workload	150 h (5% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

Module Description for Module 3: Introduction to Computer Science

Module title	Introduction to Computer Science
Module number	M3
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	1
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>The students have the ability to:</p> <ul style="list-style-type: none"> • demonstrate knowledge of the different areas of Computer Science • explain the classic computer model according to von Neumann • understand number processing at hardware level • know the structure and the mode of operation of micro-processors • understand the computer processes during programming and programme run <p>The following extracurricular skills are acquired: social responsibility of Computer Science, handling scientific definitions and terms.</p>
Contents of the module	Lecture Introduction to Computer Science Exercise Introduction to Computer Science
Teaching methods of the module	Lectures and exercises
Total workload	150 h (5% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

Module Description for Module 4: Introduction to Programming

Module title	Introduction to Programming
Module number	M4
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	2 semesters
Status	Compulsory module
Recommended semester during the programme	1-2
Credit points (Cp) of the module	15
Prerequisites for module participation	None
Prerequisites for module examination	<ol style="list-style-type: none"> 1. Requirement for the participation in the partial module exam performances "Introduction to Programming with C": <ol style="list-style-type: none"> i. Active participation (min. 80%) in exercises of the unit „Exercise Programming with C“ 2. Requirement for the participation in the partial module exam performances for "Object-oriented Programming Basics": <ol style="list-style-type: none"> i. A successfully completed partial module examination in „Introduction to Programming with C“ ii. Active participation (min. 80%) in exercises of the unit „Exercise Object-oriented Programming Basics“
Module examination	<p>The examination includes two partial module examinations that are arranged in succession:</p> <ul style="list-style-type: none"> • "Introduction to Programming with C" in the form of a computer examination 120 minutes • "Object-oriented Programming Basics" in the form of a computer examination 120 minutes
Intended learning outcomes /acquired competences of the module	<p>After successful completion of the programmes, the students have the following core competencies:</p> <ul style="list-style-type: none"> • A good command of the most important linguistic elements and archiving functions • Ability to formulate solutions for simple tasks as a structured design, as well as their implementation in C • A good command of methods for error detection and error elimination • Modes of thinking and approaching based on Object-oriented programming • Understanding of concepts such as data encapsulation and code

	<p>reuse.</p> <ul style="list-style-type: none"> • Classes, inheritance, polymorphism. <p>The following extracurricular skills are acquired: concept formation, structured problem solving, creative problem solving and command of methods for error detection and elimination. Capacity for teamwork by means of cooperation in groups and the ability to accept criticism and conflicts respectively as well as reflecting capacity, communication, connection of theory and practice.</p>
Contents of the module	<p>Lecture Introduction to Programming with C Exercise Introduction to Programming with C Lecture Object-oriented Programming Basics Exercise Object-oriented Programming Basics</p>
Teaching methods of the module	Lectures and exercises
Total workload	450 h (10% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

Module Description for Module 5: Business Administration

Module title	Business Administration
Module number	M5
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	1
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>Based on operational functional business areas, the students have the ability to establish and understand the connection with intra- and inter-company IT support.</p> <p>They have an insight into important application areas of IT and understand the importance of IT for the company and for society.</p> <p>The students understand important basic concepts of business activities</p> <ul style="list-style-type: none"> - Organisation, - Finance, - Human Resources, - Controlling as well as - Internal Supply Chains. <p>They have become acquainted with selected business processes within a company and are able to analyse business processes with suitable instruments.</p> <p>They are acquiring the following extracurricular skills: interdisciplinary thinking, transfer, awareness of different scientific approaches and methods.</p>
Contents of the module	Lecture Business Management
Teaching methods of the module	Lecture
Total workload	150 h (5% extracurricular skills)
Language of the module	English

Frequency of the module	Annually
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Module description of Module 6: English

Module title	English
Module number	M6
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other study programmes
Duration of the module	2 semesters
Status of the module	Compulsory module
Recommended semester during the study programme	1-2
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	Active participation in at least 80% of the practice sessions in English 1; successful presentation in English (15 mins) in English 2.
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>Students can cope with the general requirements of professional communication in English; they can handle typical professional situations of international communication with both specialists of their own field and non-specialists.</p> <p>By promoting the students' competence in English, this module also contributes to the development of extracurricular skills (key skills): Presentation skills, writing skills; verbal communication; technical vocabulary and terminology.</p>
Contents of the module	English 1 English 2
Teaching methods of the module	Practice sessions
Total workload	150 h = 85 h contact + 65 h self-study
Language of the module	English
Frequency of the module	Module begins each winter semester: English 1 in winter semester, English 2 in summer semester.

Module Description for Module 7: Discrete Mathematics

Module title	Discrete Mathematics
Module number	M7
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	2
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>Based on the modules Algebra and Analysis, the students deepen their ability to work with abstract concepts. This is a key qualification for Computer Science. Precisely, the students acquire the most important mathematical techniques for applications in the core disciplines of Computer Science (Theoretical Computer Science, Computer Architecture, Operating Systems, Computer Networks, etc.) within this module.</p> <p>The students have fundamental competencies and knowledge in the field of discrete mathematics. They have the ability to apply concepts and processes they have become acquainted with during the module.</p> <p>They have the ability to implement discrete mathematics solutions in simple cases of applications and to assess the results. The students have the ability to identify the relations between discrete mathematics and core disciplines of Computer Science and they have the ability to adequately apply processes of discrete mathematics in those contexts.</p> <p>The competencies in dealing with formal systems and models are further developed in this module.</p> <p>Furthermore, the following extracurricular skills are acquired in the module: logical thinking, ability to think in abstract terms, scientific processes, attention to detail.</p>
Contents of the module	Lecture Discrete Mathematics Exercise Discrete Mathematics
Teaching methods of the module	Lectures and exercises
Total workload	150 h (5% extracurricular skills)

Language of the module	English
Frequency of the module	Annually

Module Description for Module 8: Computer Architectures

Module title	Computer Architectures
Module number	M8
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	2
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	Active participation (min. 80%) in exercises of the unit "Exercises for Computer Architectures and Assembler Languages"
Module examination	Independent programming in the form of an exam, partially at the computer 120 minutes
Intended learning outcomes /acquired competences of the module	<p>The students acquire theoretical and practical competencies in the following areas:</p> <p>Digital technology:</p> <ul style="list-style-type: none"> • Knowledge of the electronic boundary conditions during the operation of digital switching mechanisms • Knowledge of the systematic design of digital switching mechanisms. <p>Computer Architectures:</p> <ul style="list-style-type: none"> • Understanding of the most important architectural principles for the design of computer systems • Knowledge of the different levels of command processing <p>Assembler Languages:</p> <ul style="list-style-type: none"> • Understanding of the most important principles of the assembler languages • Basic knowledge of programming in a suitable assembler language <p>Furthermore, the following extracurricular skills are acquired: structured problem solving, creative problem solving.</p>
Contents of the module	Lecture Computer Architectures and Assembler Languages Exercises for Computer Architectures and Assembler Languages
Teaching methods of the module	Lectures, Exercises
Total workload	150 h (5% extracurricular skills)

Language of the module	English
Frequency of the module	Always in the summer semester

Module Description for Module 9: Algorithms and Data Structures

Module title	Algorithms and Data Structures
Module number	M9
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	2
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>The students should have a conceptual understanding of algorithms, data structures, complexity etc. in order to have the ability for the following aspects of simple to medium level problems</p> <ul style="list-style-type: none"> • Create suitable new data structures (based on the standard structures discussed in the course) • Develop and demonstrate algorithms based on the methods learned in the module • Assess possible solutions with respect to accuracy, complexity and elegance. <p>The students should have the ability to confidently and competently apply concepts and techniques acquired in this module in subsequent modules within Computer Science.</p> <p>In addition to that, the following extracurricular skills are acquired: scientific and accurate work, structured problem solving, creative problem solving, team work during the exercises, communications.</p>
Contents of the module	<p>Lecture Algorithms and Data Structures</p> <p>Exercises Algorithms und Data Structures</p>
Teaching methods of the module	Lectures and exercises
Total workload	150 h (5% extracurricular skills)
Language of the module	English
Frequency of the module	Summer semester only

Prüfungsordnung zum Bachelor-Studiengang Computer Science

Module Description for Module 10: Theoretical Computer Science

Module title	Theoretical Computer Science, Automata and Formal Languages
Module number	M10
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	2
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>In this module, the students acquire the theoretical basics for the operating principles of computers and for the concepts of programming languages. The students learn the basic concepts of automata and the formal languages and they understand their relevance for the architectural principles of computers on the one hand and for higher level programming languages and other areas of Computer Science on the other hand.</p> <p>In addition to this, the following extracurricular skills are acquired: concept formation, scientific work, structured problem solving, creative problem solving</p>
Contents of the module	<p>Lecture Theoretical Computer Science, Automata and Formal Languages</p> <p>Exercises Theoretical Computer Science, Automata and Formal Languages</p>
Teaching methods of the module	Lectures , exercises
Total workload	150 h (5% extracurricular skills)
Language of the module	English
Frequency of the module	Always in the summer semester

Prüfungsordnung zum Bachelor-Studiengang Computer Science

Modulbeschreibung zum Modul 11: Software Engineering - Analysis

Module title	Software Engineering - Analysis
Module number	M11
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	3
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	Passing of all attestations in parallel to the unit „Exercises – Software Engineering – Analysis“ (Workload 24 hours)
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<ul style="list-style-type: none"> - Assessment and estimation of the applicability of software engineering methods in an application development context - Knowledge and understanding of different models of the software process and of classical and object-oriented software requirements analysis - Understanding the roles of software developers and project managers - Basic proficiency in the software engineering of large software systems <p>Extracurricular skills (20% of total workload): project- and teamwork, methods of project management, presentation techniques, ability to judge, English as the language of software engineering, socio-cultural importance of Computer Science, systems analysis and design, working in international teams</p>
Contents of the module	Lectures Software Engineering – Analysis Exercises Software Engineering - Analysis
Teaching methods of the module	Lectures: Interactive lectures Exercises: Teamwork in small groups
Total workload	150 h (20% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

Module description of Module 12: Statistics

Module title	Statistics
Module number	M12
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	3
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes.
Intended learning outcomes /acquired competences of the module	<p>The students have learned basic ideas and methods of descriptive statistics, probability theory and inferential statistics, based on their knowledge from the modules Analysis and Discrete Mathematics.</p> <p>The students can use basic methods of the descriptive statistics. They can handle the concept of probability theory and its mathematical implementation in the context of discrete and continuous stochastic models. They are acquainted with the basic ideas of inferential statistics and can apply some important estimation and test methods and interpret the results thereof.</p> <p>The module extends and deepens the mathematical method competence and the ability to handle formal concepts and systems.</p> <p>Extracurricular skills: scientific work, technical English</p>
Contents of the module	Lecture Statistics, Exercise Statistics
Teaching methods of the module	Lecture, Exercise
Total workload	150 h (5% extracurricular skills)
Language of the module	English
Frequency of the module	Winter semester

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Module description of Module 13: Object-oriented Programming

Module title	Object-oriented Programming with Java - Advanced Course
Module number	M13
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	3 rd semester
Credit points (Cp) of the module	5 CP
Prerequisites for module participation	Successful participation in module 4: "Introduction to Programming"
Prerequisites for module examination	Successful participation in module 4: "Introduction to Programming"
Module examination	Project work (6 weeks). The students have to develop a Java application including complete documentation. The program has to be correct with respect to its specification.
Intended learning outcomes /acquired competences of the module	<p>The students are able to design and implement demanding Java applications</p> <p>The students acquire broad and deepened expertise concerning object-oriented programming</p> <p>The students improve their ability to work in teams and thus acquire extracurricular skills</p>
Contents of the module	<p>Constructs of object-oriented programming, in particular constructs of the Java programming language</p> <p>Platform-independent specification</p> <p>Design and implementation of applications with a dialogue surface area using at least one pre-built class library.</p>
Teaching methods of the module	Lectures and exercises.
Total workload	<p>150 hours</p> <p>15 hours extracurricular skills</p>
Language of the module	English
Frequency of the module	Winter semester

Module description of Module 14: Databases

Module title	Databases
Module number	M14
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable as well to other Computer Science bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	3
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 120 minutes
Intended learning outcomes /acquired competences of the module	<p>Databases are incredibly prevalent and play a key role in just about any IT system that maintains some amount of persistent information. This module conveys core competencies in the discipline of computer science, which will qualify students to design and use databases as a central component for information processing.</p> <p>The focus is on relational databases: the students will gain a solid knowledge of the relational data model and the practical usage. They will learn through practical exercises using a specific database management system to master the standard database language SQL.</p> <p>Furthermore, the following extracurricular skills will be acquired: project- and teamwork, structured problem solving, creative problem solving, English language</p>
Contents of the module	Lecture Databases Exercises Databases
Teaching methods of the module	Lecture Databases Exercises Databases
Total workload	150 h (10% extracurricular skills)
Language of the module	English
Frequency of the module	Each winter semester

Modulbeschreibung zum Modul 15: Computer Networks

Module title	Computer Networks
Module number	M15
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	3
Credit points (Cp) of the module	10
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>Students gain the following core competencies:</p> <ul style="list-style-type: none"> - Knowledge about fundamental concepts of computer systems and their interconnection via computer networks - Knowledge and understanding of basic concepts of communication protocols and their use in computer networks <p>Moreover, the following extracurricular skills are acquired: working in groups in the lab, structured problem solving, English language skills.</p>
Contents of the module	<p>Lecture Computer Networks</p> <p>Exercises Computer Networks</p> <p>Laboratory Computer Networks</p>
Teaching methods of the module	Lecture, Exercise, Lab work
Total workload	300 h (10% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

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Modulbeschreibung zum Modul M16: Operating Systems

Module title	Operating Systems
Module number	M16
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	4
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>Students gain the following core competencies:</p> <ul style="list-style-type: none"> - Knowledge about fundamental concepts of computer systems, especially the task of operating systems - Understanding and knowledge of basic concepts and methods for the implementation of operating systems <p>Moreover, the following extracurricular skills are acquired: working in groups in the lab, structured problem solving, English language skills.</p>
Contents of the module	Lecture Operating Systems Exercises Operating Systems
Teaching methods of the module	Lecture, Exercise
Total workload	150 h (10% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

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Modulbeschreibung zum Modul 17: Software Engineering - Design

Module title	Software Engineering - Design
Module number	M17
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	4
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	Passing of all attestations parallel to the unit „Exercises – Software Engineering – Design“ (Workload 24 hours)
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<ul style="list-style-type: none"> - Knowledge and mastering of the basic principles and concepts of software design and implementation - Capability to critically assess and estimate the usage of the various methods of software design in the application development context - Understanding the roles of software developers and project managers - Enhanced proficiency in the software engineering of large software systems <p>Extracurricular skills (20% of total workload): project- and teamwork, methods of project management, presentation techniques, ability to judge, English as the language of software engineering, socio-cultural importance of Computer Science, systems analysis and design, working in international teams</p>
Contents of the module	Lectures Software Engineering – Design Exercises Software Engineering - Design
Teaching methods of the module	Lectures: Interactive lectures Exercises: Teamwork in small groups
Total workload	150 h (20% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

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Module description of Module 18: Realtime Systems

Module title	Realtime Systems
Module number	M18
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	4
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	Successful passing of all exercises parallel to the unit „Laboratory Realtime Systems“ (workload 24 h)
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>In the scope of programming, technical and mobile systems time-dependent operations play an important role. This includes real time scheduling as well as the integration of actuators and sensors. In this module, the ability to model and implement realtime systems is taught. A goal is the ability to model and program time-dependent procedures, within a system and the communication with external devices.</p> <p>Additionally the following extracurricular skills will be acquired: group work in the laboratory, structured problem solving, creative problem-solving, technical language English</p>
Contents of the module	Lectures Realtime Systems Laboratory Realtime Systems
Teaching methods of the module	Lectures and Laboratory
Total workload	150 h
Language of the module	English
Frequency of the module	Annually

Modulbeschreibung zum Modul 19: IT-Security

Module title	IT Security
Module number	M19
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	4
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>The students gain the following core competencies:</p> <ul style="list-style-type: none"> - Knowledge about fundamental concepts of IT Security - Development of a consciousness for IT Security aims and risks - Comprehension and knowledge of basic solutions, concepts and methods to implement IT Security <p>Moreover, the following extracurricular skills are acquired: working in groups in the lab, structured problem solving, English language skills, economic and social impact of IT Security</p>
Contents of the module	<p>Technical and organizational basics of safe and secure IT-Systems are an increasingly important area in Computer Science. In this module, students gain competencies in this area.</p> <p>For further details, please see Unit descriptions.</p>
Teaching methods of the module	Lecture, Exercise
Total workload	150 h (10% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

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Module description of Module 20: Distributed Systems

Module title	Distributed Systems
Module number	M20
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	4
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	Passing of all attestations parallel to the unit „Exercises – Distributed Systems“ (Workload 24 hours)
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>The students will acquire the theoretical basics for implementing distributed applications with heterogeneous technologies which are used within the industry. The students will continuously improve their understanding by implementing practical examples, thereby acquiring practical skills as well. This includes the installation of SW components on PCs and configuration accordingly. The students can assess different technologies and decide upon their benefits in concrete application contexts in order to have the ability to design suitable applications themselves.</p> <p>Thus, the students acquire competency in solving problems in developing distributed applications on the basis of a sound theoretical foundation.</p> <p>In addition, the following extracurricular skills are acquired: usage of frameworks and libraries, structured and creative problem solving, technical terminology and English</p>
Contents of the module	Theories, concepts and implementation of distributed applications. For further details, please see "Unit Description" below.
Teaching methods of the module	Lectures and Exercises
Total workload	150 h (10% extracurricular skills)
Language of the module	English
Frequency of the module	Summer semester only

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Module description of Module 21: Programming Exercises

Module title	Programming Exercises
Module number	M21
Study programme	Computer Science
Applicability of the module to other study programmes	Applicable to other Computer Science Bachelor programmes
Duration of the module	1 semester
Status of the module	Compulsory module
Recommended semester during the study programme	4
Credit points (Cp) of the module	5
Prerequisites for module participation	1. Passed (partial) "Introduction to Programming with C" (M4). 2. Passed examination for module „Databases“ (M14).
Prerequisites for module examination	None
Module examination	Written project report (8 weeks) and oral presentation (min. 15 min, max. 20 min)
Intended learning outcomes /acquired competences of the module	<p>Students are able to implement a realistic application covering aspects of distributed systems and a RDBMS. To this end, they work in project teams and apply techniques from software engineering. Students can apply basic IT-project management skills.</p> <p>In addition to this, the students acquire the following extracurricular skills: project work, self organization, English</p>
Contents of the module	<p>Consolidation of software development and engineering using suitable tools. By working in a team, students get exposed to modern project management techniques.</p> <p>For further details, please see "Unit Description" below.</p>
Teaching methods of the module	Project
Total workload	150 h (25% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

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Module Description for Module M22: Law and Data Protection

Module title	Law and Data Protection
Module number	M22
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	5
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	<p>The students are acquainted with the basic legal terminologies of civil law (contracts, terms and conditions, copyright law) and have obtained a broadened knowledge of data protection law in particular.</p> <p>The students have the ability to solve legal case problems independently.</p> <p>In addition to this, the following extracurricular skills are developed: structured problem solving, ability to make sound decisions, considering the projects in terms of legal aspects.</p>
Contents of the module	<p>Lecture Law and Data Protection</p> <p>Exercise Law and Data Protection</p>
Teaching methods of the module	Lectures and exercises
Total workload	150 h (10% extracurricular skills)
Language of the module	English
Frequency of the module	Annually

Module Description for Module 23: Current Topics in Computer Science

Module title	Current Topics in Computer Science
Module number	M23
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	5
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	<p>The examination comprises two module part examinations in the courses of the module:</p> <ol style="list-style-type: none"> 1. Lecture: Written exam - 90 minutes 2. Seminar: Written composition (workload 50 hours) and Presentation (min. 15 min., max. 90 min.) <p>The final mark for the module is comprised in equal parts by the marks of the module part examinations.</p>
Intended learning outcomes /acquired competences of the module	<p>In addition to the compulsory courses, the individual specialization in a compulsory optional area selected by the students is supported by various special course offers. A core learning goal of the module is the ability to independently work on issues concerning Computer Sciences. Additionally, the following extracurricular skills are acquired: individual specialization of students in a compulsory optional area, independent scientific work</p>
Contents of the module	<p>Lecture Current Topics in Computer Science Seminar Current Topics in Computer Science</p>
Teaching methods of the module	Lecture, seminar
Total workload	150h (15% extracurricular skills)
Language of the module	English
Frequency of the module	Each semester

Module Description for Module 24: Project

Module title	Project
Module number	M24
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	5
Credit points (Cp) of the module	10
Prerequisites for module participation	<ol style="list-style-type: none"> 1. Successful participation in Module 14 "Introduction to Programming" 2. Successful participation in Module 11 "Software Engineering – Analysis" or Module 17 "Software Engineering – Design" 3. A minimum of 80 credits acquired in the first 4 semesters
Prerequisites for module examination	None
Module examination	Project work (8 weeks) and presentation (min. 15 min. and max. 20 min.)
Intended learning outcomes /acquired competences of the module	<ul style="list-style-type: none"> - Improvement of the technical abilities for programming, documentation, SW engineering, presentation and communication. - Improvement of technical abilities in one or more areas of the curriculum (e.g. networks, distributed applications, etc.) <p>In addition, the following extracurricular skills are acquired</p> <ul style="list-style-type: none"> - Gaining project experience (i.e. developing the ability to reach a goal within a limited period of time). Gathering of experience by working in a team - Developing time management skills - Developing the ability to communicate with others at a high technical level - Overcoming unexpected difficulties (of technical as well as social nature) - Tolerance toward project partners. - Taking responsibility
Contents of the module	Project
Teaching methods of the module	<p>Regular (weekly) project discussions with work package assignments and presentation of results, etc.</p> <p>Working in groups and individually depending on assignments allocated in the project discussions</p>

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Total workload	300h (30% extracurricular skills)
Language of the module	English
Frequency of the module	Each semester

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Module Description for Module 25.1: Human Machine Interfaces (HMI)

Module title	Human Machine Interfaces
Module number	M25.1
Programme	Computer Science
Applicability of the module	Applicable also to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory optional module
Recommended semester during the programme	5
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	Project work (8 weeks) and presentation (min. 15 min. and max. 20 min.)
Intended learning outcomes /acquired competences of the module	<p>The students are to develop an understanding of models, methods and concepts of human-machine interactions. The focus is on the user interfaces of mobile devices.</p> <p>Furthermore, they gain problem solving competencies in software technology for the specification and implementation of user interfaces on a theoretical basis.</p>
Contents of the module	<p>Lecture Human Machine Interfaces</p> <p>Exercises Human Machine Interfaces</p>
Teaching methods of the module	Lecture and exercises
Total workload	150 h
Language of the module	English
Frequency of the module	Winter semester only

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Module Description for Module 25.2: Data Mining and Personalized Medicine

Module title	Data Mining and Personalized Medicine
Module number	M25.2
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory optional module
Recommended semester during the programme	5
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	Active participation (min. 80%) in exercises of the unit "Exercises in Data mining and Personalised Medicine"
Module examination	Oral exam (min. 15 min. and max. 20 min.)
Intended learning outcomes /acquired competences of the module	<ul style="list-style-type: none"> • Overview of omics-data (Genomics, Transcriptomics, Proteomics, etc.) • Overview of relevant data resources • Introduction to multivariate statistics, cluster and classification processes • Handling various processes in the applications.
Contents of the module	Lecture Data Mining and Personalized Medicine Exercises Data Mining and Personalized Medicine
Teaching methods of the module	Lecture and exercise
Total workload	150
Language of the module	English
Frequency of the module	Winter semester only

Module Description for Module 25.3: Embedded Systems and Mobile Devices

Module title	Embedded Systems and Mobile Devices
Module number	M25.3
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory optional module
Recommended semester during the programme	5
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	Successful completion of all certificates offered in parallel to the courses for the unit "Laboratory Embedded Systems and Mobile Devices" (workload 24 hours)
Module examination	Written exam - 90 minutes
Intended learning outcomes /acquired competences of the module	In many programming areas of embedded and mobile systems time-sensitive processes play an important role. This includes real-time scheduling as well as the integration of actuators and sensors. This module conveys the ability to model embedded and mobile systems and implement them into executable programmes. The goal of the module is to achieve the ability to model and program time-sensitive processes within a system as well as the communication with external devices .
Contents of the module	Lecture Embedded Systems and Mobile Devices Laboratory Embedded Systems and Mobile Devices
Teaching methods of the module	Lecture and laboratory
Total workload	150 h
Language of the module	English
Frequency of the module	Summer semester only

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Module Description for Module 25.4 Medical Image Processing

Module title	Medical Image Processing
Module number	M25.4
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory optional module
Recommended semester during the programme	5
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	Active participation (min. 80%) in all exercises for the unit "Exercises Medical Image Processing" (workload: 25 h)
Module examination	Oral exam (min. 15 minutes and max. 90 minutes)
Intended learning outcomes /acquired competences of the module	<ul style="list-style-type: none"> • Overview of imaging processes in medicine • Overview of imaging data formats and their storage • Overview of imaging process methods in support of diagnoses and therapy • Handling the various processes in the application
Contents of the module	Lecture Medical Image Processing Exercises Medical Image Processing
Teaching methods of the module	Lectures and exercises
Total workload	150
Language of the module	English
Frequency of the module	Summer semester only

Module Description for Module 26: General Studies

Module title	General Studies
Module number	M26
Programme	Computer Science
Applicability of the module	Applicable to all Bachelor programmes at the Fachhochschule Frankfurt
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	5
Credit points (Cp) of the module	5
Prerequisites for module participation	None
Prerequisites for module examination	None
Module examination	<p>The module is completed by an examination.</p> <p>In accordance with § 10 of the “General Provisions for Examination Regulations”, the examination can be a written exam, an oral exam or a project work. Other forms of examinations are also possible. The mode of the examination performance depends on the respective configuration of the module exemplar.</p>
Intended learning outcomes /acquired competences of the module	<p>The General Studies module forms the profile character of the interdisciplinary orientation of the FH FFM on the level of individual programmes. It is a module forming an interdisciplinary topic, where they are connected and integrated. This is offered as a compulsory module to students of all faculties for the acquisition of a range of competencies.</p> <p>The students acquire the following extracurricular skills:</p> <ul style="list-style-type: none"> • The ability to think in interdisciplinary terms and act cooperatively • Overcoming the limitations of their faculty-specific thought structures (theories and methods) • The ability to recognize scientific and technical, economic and legal, cultural, social and personal aspects by an exemplary cross-sectional topic and to balance and reflect on them comprehensively • Explicating the nexus of their faculty in the context of different scientific disciplines, as well as societal interests (communicate, present, discuss) • Reflecting the effects and consequences of their professional and societal activities and thus have the ability to deduct from this the consequences of their own actions.
Contents of the module	An interdisciplinary subject in accordance with the current announcements
Teaching methods of the module	Varies by module

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Total workload	150h (20% extracurricular skills)
Language of the module	Varies by module
Frequency of the module	Each semester

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Module Description for Module 27: Practical Training Phase

Module title	Practical Training Phase
Module number	M27
Programme	Computer Science
Applicability of the module	Applicable to other Computer Science Bachelor programmes
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	6
Credit points (Cp) of the module	18
Prerequisites for module participation	Successful completion of modules in the first 5 semesters comprising 120 credit points.
Prerequisites for module examination	Release of the report by the host company
Module examination	<p>Report (workload: 24 hours) and presentation (20 min. with a subsequent discussion), as well as attendance of 80% of all seminar appointments. Missed seminar appointments must be formally excused (e.g. a doctor's certificate or a testimonial by the host company to confirm the participation in training courses or fair visits).</p> <p>The mark is comprised of the report and the presentations, provided the attendance requirement has been fulfilled.</p>
Intended learning outcomes /acquired competences of the module	<ul style="list-style-type: none"> • The orientation in the desired professional field • The ability to conduct work responsibly in cooperation with others • The ability to assess unknown software systems • Insights into important application fields in Computer Science <p>Additionally, the following extracurricular skills are developed:</p> <ul style="list-style-type: none"> • Understanding of the relevance of IT for the organisation and for society • The ability to independently develop a presentation on professional activities and hold this presentation using modern presentation techniques within a given timeframe. • The ability to create a multi-page report in an adequate format
Contents of the module	Seminar for the Practical Training Phase Supervised Practical Training Project
Teaching methods of the module	Seminar and supervised project
Total workload	540 h (30% - extracurricular skills)
Language of the module	English
Frequency of the module	All year

Module Description for Module 28: Bachelor Thesis with Colloquium

Module title	Bachelor Thesis with Colloquium
Module number	M28
Programme	Computer Science
Applicability of the module	
Module duration	1 semester
Status	Compulsory module
Recommended semester during the programme	6
Credit points (Cp) of the module	12 CP
Prerequisites for module participation	Evidence of the commencement of module M27 Practical Training Phase in the form of a signed training contract as well as the successful completion of all modules M1 to M26 in the first 5 semesters.
Prerequisites for module examination	None
Module examination	Bachelor Thesis (weighting 80%) and Colloquium (min. 30 min. and max. 60 min., weighting 20%) The colloquium requires the successful completion of the Bachelor Thesis.
Intended learning outcomes /acquired competences of the module	The students acquire technical and interdisciplinary abilities to work as computer scientists. The students have competencies in the areas techniques of scientific work, negotiation, assertiveness, presentation techniques, project management, conflict management, planning of new systems, networked thinking, creativity and transferability (70 % faculty-specific competencies; 30 % interdisciplinary competencies)
Contents of the module	Bachelor Thesis with Colloquium
Teaching methods of the module	Independent study
Total workload	360 h (30% extracurricular skills)
Language of the module	English
Frequency of the module	Each semester



Diploma Supplement

This Diploma Supplement model was developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international "transparency" and fair academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.) It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free of any value judgements, equivalence statements or suggestions about recognition. Information in all sections should be provided. Where information is not provided, an explanation should give the reason why.

1. HOLDER OF THE QUALIFICATION

1.1 Family Name / 1.2 First Name

individuell

1.3 Date, Place, Country of Birth

individuell

1.4 Student ID Number or Code

individuell

2. QUALIFICATION

2.1 Name of Qualification / Titel Conferred (full, abbreviated; in original language)

Bachelor of Science, B.Sc.

2.2 Main Field(s) of Study

Computer Science

2.3 Institution Awarding the Qualification (in original language)

Fachhochschule Frankfurt am Main - University of Applied Sciences
Department of Computer Science and Engineering

Status (Type / Control)

University of Applied Sciences / State Institution

2.4 Institution Administering Studies (in original language)

(same)

Status (Type / Control)

(same)

2.5 Language(s) of Instruction/Examination

English

3. LEVEL OF THE QUALIFICATION

3.1 Level

first degree (3 years), including thesis

3.2 Official Length of Programm

3 years, 180 CP

3.3 Access Requirements

General or specialized Higher Education Entrance Qualification (HEEQ), cf. Sect. 8.7., or foreign equivalent.

4. CONTENTS AND RESULTS GAINED

4.1 Mode of Study

Full time

4.2 Programme Requirements/ Qualification Profile of the Graduate

The aims and objectives are as follows:

- (a) to qualify students for the use of abstract methods, structures and patterns and familiarize students with the principles of Computer Science and underlying subjects
- (b) to provide students with core competences in the main areas of computer science, system analysis, programming and use of complex applications
- (c) to familiarize students with the current professional methods of software development in theory and practice
- (d) to enable students to get familiar with new technologies and application areas and enable them for a life long learning
- (e) to provide students with the personal skills (teamwork, articulation, ...) and professional perspectives to enable them to be effective in the application of Computer Science in the various areas.

4.3 Programme details

See "Transcript of records" for list of courses and grades, and "Prüfungszeugnis" (Final Examination Certificate) for subjects offered in final examinations (written and oral), and topic of thesis, including evaluations.

4.4 Grading Scheme

General grading scheme cf. Sec. 8.6 – In addition, the ECTS grading scheme is used which operates with the levels A (best 10%), B (next 25%), C (next 30%), D (next 25%), E (next 10%).

4.5 Overall Classification (in original language)

Individuell: sehr gut; gut; befriedigend; ausreichend

Based on the accumulation of grades received during the study programme and the final thesis.

cf. Bachelorzeugnis (Final Examination Certificate)

5. FUNCTION OF THE QUALIFICATION

5.1 Access to Further Study

Qualifies to apply for admission for Master studies

5.2 Professional status

The degree entitles the holder to computer science functions in companies and private and state institutions.

6. ADDITIONAL INFORMATION

6.1 Additional Information

The programme includes an internship of 14 weeks (18 ECTS) in a company or state institution.

6.2 Further information sources

On the institution: www.fh-frankfurt.de

On the program: www.fb2.fh-frankfurt.de

For national information sources cf. Sect. 8.8

7. CERTIFICATION

This Diploma Supplement refers to the following documents:

Urkunde über die Verleihung des Bachelor-Grades vom TAG.MONAT.JAHR

Prüfungszeugnis vom TAG.MONAT.JAHR

Transcript of records vom TAG.MONAT.JAHR

Certification Date: <DATE>

(Official Stamp/ seal)

Chairperson Examination Committee

8. NATIONAL HIGHER EDUCATION SYSTEM

The information on the national higher education system on the following pages provides a context for the qualification and the type of higher education that awarded it.

8. INFORMATION ON THE GERMAN HIGHER EDUCATION SYSTEM¹

8.2 Types of Programmes and Degrees Awarded
8.2 Types of Programmes and Degrees Awarded

8.1 Types of Institutions and Institutional Status

Higher education (HE) studies in Germany are offered at three types of Higher Education Institutions (HEI).²

Studies in all three types of institutions have traditionally been offered in integrated "long" (one-tier) programmes leading to *Diplom-* or *Magister Artium* degrees or completed by a *Staatsprüfung* (State Examination).

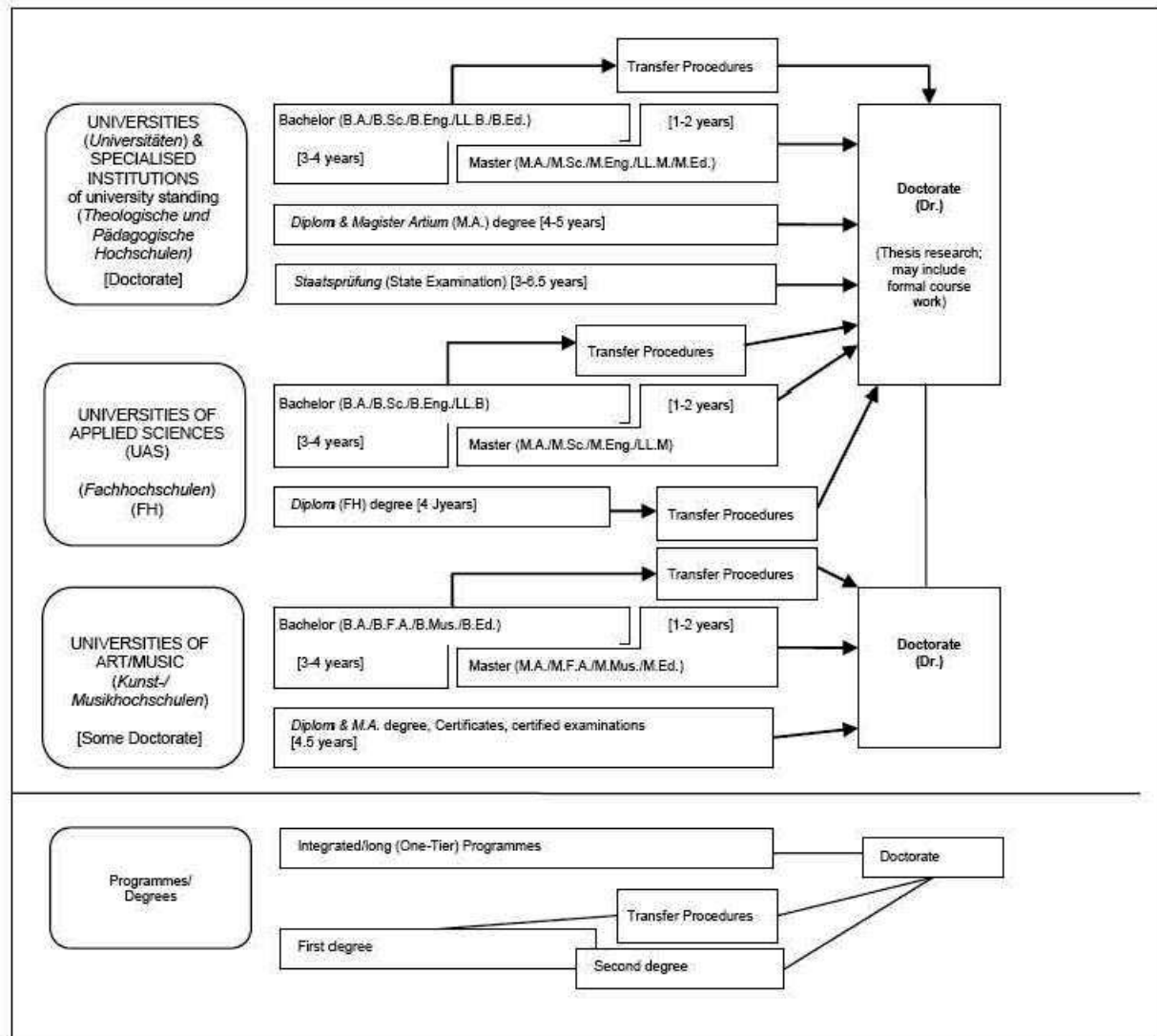
- *Universitäten* (Universities whole range of academic focus in particular on basic mainly theoretical orientation

- *Fachhochschulen* (Univer programmes in engineering studies, social work, and research and development professional character of : work assignment in industry

- *Kunst- und Musikhochsc* artistic careers in fine art directing, production, writin of design areas, architectur

Higher Education Institution In their operations, includin award of degrees, they are

Table 1: Institutions, Programmes and Degrees in German Higher Education



8.4 Organisation and Structure of Studies

The following programmes apply for all three types of institutions. Bachelor's and Master's study courses may be studied consecutively, at various higher education institutions, at different types of higher education institutions and with phases of professional work between the first and the second qualification. The organisation of the study programmes makes use of modular components and of the European Credit Transfer System (ECTS) with 30 credits corresponding to one semester.

8.4.1 Bachelor

Bachelor degree study programmes lay the academic foundations, provide methodological skills and lead to qualifications related to the professional field. The Bachelor degree is awarded after 3 to 4 years.

The Bachelor degree programme includes a thesis requirement. Study courses leading to the Bachelor degree must be accredited according to the Law establishing a Foundation of the Accreditation of Study Programmes in Germany.^{vi}

First degree programmes (Bachelor) lead to Bachelor of Arts (B.A.), Bachelor of Science (B.Sc.), Bachelor of Engineering (B.Eng.), Bachelor of Laws (LL.B.), Bachelor of Fine Arts (B.F.A.), Bachelor of Music (B.Mus.) or Bachelor of Education (B.Ed.).

8.4.2 Master

Master is the second degree after another 1 to 2 years. Master study programmes may be differentiated by the profile types "practice-oriented" and "research-oriented". Higher Education institutions define the profile.

The Master degree study programme includes a thesis requirement. Study programmes leading to the Master degree must be accredited according to the Law establishing a Foundation of the Accreditation of Study Programmes in Germany.^{vi}

Second degree programmes (Master) lead to Master of Arts (M.A.), Master of Science (M.Sc.), Master of Engineering (M.Eng.), Master of Laws (LL.M.), Master of Fine Arts (M.F.A.), Master of Music (M.Mus.) or Master of Education (M.Ed.). Master study programmes which are designed for continuing education may carry other designations (e.g. MBA).

8.4.3 Integrated "Long" Programmes (One-Tier): Diplom degrees, Magister Artium, Staatsprüfung

An integrated study programme is either mono-disciplinary (*Diplom* degrees, most programmes completed by a *Staatsprüfung*) or comprises a combination of either two major or one major and two minor fields (*Magister Artium*). The first stage (1.5 to 2 years) focuses on a broad orientation and foundations of the field(s) of study. An Intermediate Examination (*Diplom-Vorprüfung* for *Diplom* degrees; *Zwischenprüfung* or credit requirements for the *Magister Artium*) is a prerequisite to enter the second stage of advanced studies and specialisations. Degree requirements include submission of a thesis (up to 6 month duration) and comprehensive final written and oral examinations. Similar regulations apply to studies leading to a *Staatsprüfung*. The level of qualification is equivalent to the Master level.

- Integrated studies at *Universitäten* (U) last 4 to 5 years (*Diplom* degree, *Magister Artium*) or 3 to 6.5 years (*Staatsprüfung*). The *Diplom* degree is awarded in engineering disciplines, the natural sciences as well as economics and business. In the humanities, the corresponding degree is usually the *Magister Artium* (M.A.). In the social sciences, the practice varies as a matter of institutional traditions. Studies preparing for the legal, medical and pharmaceutical professions are completed by a *Staatsprüfung*. This applies also to studies preparing for teaching professions in some *Länder*.

The three qualifications (*Diplom*, *Magister Artium* and *Staatsprüfung*) are academically equivalent. They qualify to apply for admission to doctoral studies. Further prerequisites for admission may be defined by the Higher Education Institution, cf. Sec. 8.5.

- Integrated studies at *Fachhochschulen* (FH)/Universities of Applied Sciences (UAS) last 4 years and lead to a *Diplom* (FH) degree. While the FH/UAS are non-doctorate granting institutions, qualified graduates may apply for admission to doctoral studies at doctorate-granting institutions, cf. Sec. 8.5.

- Studies at Kunst- and Musikhochschulen (Universities of Art/Music etc.) are more diverse in their organisation, depending on the field and individual objectives. In addition to *Diplom*/*Magister* degrees, the integrated study programme awards include Certificates and certified examinations for specialised areas and professional purposes.

8.5 Doctorate

Universities as well as specialised institutions of university standing and some Universities of Art/Music are doctorate-granting institutions. A formal prerequisite for admission to doctoral work is a qualified Master (UAS and U), a *Magister* degree, a *Diplom*, a *Staatsprüfung*, or a foreign equivalent. Particularly qualified holders of a Bachelor or a *Diplom* (FH) degree may also be admitted to doctoral studies without acquisition of a further degree by means of a procedure to determine their aptitude. The Universities and the doctorate-granting institutions regulate entry to a doctorate as well as the structure of the procedure to determine aptitude. Admission further requires the acceptance of the dissertation research project by a professor or supervisor.

8.6 Grading Scheme

The grading scheme in Germany usually comprises five levels (with numerical equivalents; intermediate grades may be given): "Sehr Gut" (1) – Very Good; "Gut" (2) – Good; "Befriedigend" (3) – Satisfactory; "Ausreichend" (4) – Sufficient; "Nicht ausreichend" (5) – Non-Sufficient/Fail. The minimum passing

grade is "Ausreichend" (4): Verbal designations of grades may vary in some cases and for doctoral degrees.

In addition institutions partly already use an ECTS grading scheme.

8.7 Access to Higher Education

The General Higher Education Entrance Qualification (*Allgemeine Hochschulreife, Abitur*) after 12 to 13 years of schooling allows for admission to all higher educational studies. Specialised variants (*Fachgebundene Hochschulreife*) allow for admission to particular disciplines. Access to *Fachhochschulen* (UAS) is also possible with a *Fachhochschulreife*, which can usually be acquired after 12 years of schooling. Admission to Universities of Art/Music may be based on other or require additional evidence demonstrating individual aptitude.

Higher Education Institutions may in certain cases apply additional admission procedures.

8.8 National Sources of Information

- *Kultusministerkonferenz (KMK)* [Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* in the Federal Republic of Germany; Lennéstrasse 6, D-53113 Bonn; Fax: +49[0]228/501-229; Phone: +49[0]228/501-0

- "Documentation and Educational Information Service" as German EURYDICE-Unit, providing the national dossier on the education system (<http://www.kmk.org/documentation/zusammenarbeit-auf-europaeischer-ebene-im-eurydice-informationsnetz.html>; E-Mail: eurydice@kmk.org)

- Hochschulrektorenkonferenz (HRK) [German Rector's Conference]; Ahrstrasse 39, D-53175 Bonn; Fax: +49[0]228/887-110; Phone: +49[0]228/887-0; www.HRK.de; E-Mail: post@hrk.de

- „Higher Education Compass“ of the German Rector's Conference features comprehensive information on institutions, programmes of study etc. (www.higher-education-compass.de)

i

The information covers only aspects directly relevant to purposes of the Diploma Supplement. All information as of 01.07.2010.

ii

Berufsakademien are not considered as Higher Education Institutions, they only exist in some of the *Länder*. They offer educational programmes in close cooperation with private companies. Students receive a formal degree and carry out an apprenticeship at the company. Some *Berufsakademien* offer Bachelor courses which are recognised as an academic degree if they are accredited by a German accreditation agency.

iii

German Qualification Framework for Higher Education Degrees (Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* in the Federal Republic of Germany of 21.04.2005).

iv

Common structural guidelines of the *Länder* for the accreditation of Bachelor's and Master's study courses (Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* in the Federal Republic of Germany of 10.10.2003, as amended on 04.02.2010).

v

„Law establishing a Foundation, Foundation for the Accreditation of Study Programmes in Germany“, entered into force as from 26.02.2005, GV. NRW. 2005, nr. 5, p. 45 in connection with the Declaration of the *Länder* to the Foundation "Foundation for the Accreditation of Study Programmes in Germany" (Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* in the Federal Republic of Germany of 16.12.2004).

vi

See note no. 5

vii

See note no. 5