# Module Catalogue

for the Subject

# Computer Science

as vertieft studiertes Fach (studied with a focus on the scientific discipline)

with the degree "Erste Staatsprüfung für das Lehramt an Gymnasien"

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# Abbreviations used

Course types: **E** = field trip, **K** = colloquium, **O** = conversatorium, **P** = placement/lab course, **R** = project, **S** = seminar, **T** = tutorial, **Ü** = exercise, **V** = lecture

Term: **SS** = summer semester, **WS** = winter semester

Methods of grading: **NUM** = numerical grade, **B/NB** = (not) successfully completed

Regulations: **(L)ASPO** = general academic and examination regulations (for teaching-degree programmes), **FSB** = subject-specific provisions, **SFB** = list of modules

Other: **A** = thesis, **LV** = course(s), **PL** = assessment(s), **TN** = participants, **VL** = prerequisite(s)

# Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

# Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

# In accordance with

the general regulations governing the degree subject described in this module catalogue:

> **LASPO2015**

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

> **08-Sep-2015 (2015-120)**

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.

# Scientific Discipline

(92 ECTS credits)

# Compulsory Courses

(65 ECTS credits)

# General Compulsory Courses

(55 ECTS credits)

| Module title | Abbreviation |
|---|---|
| Introduction to Programming | 10-I-EinP-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science II | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 5 | numerical grade | -- | |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Data types, control structures, foundations of procedural programming, selected topics of C, introduction to object orientation in Java, selected topics of C++, further Java concepts, digression: scripting languages.

**Intended learning outcomes**

The students possess a fundamental knowledge about programming languages (in particular Java, C and C++) and are able to independently develop average to high level Java programs.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

Teaching cycle: only in winter semester

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 49 I Nr. 1 b)
§ 69 I Nr. 1 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Business Information Systems (2015)
Bachelor's degree (1 major) Human-Computer Systems (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major) Business Information Systems (2016)
Bachelor's degree (1 major) Business Information Systems (2019)

| Module title | | Abbreviation |
|---|---|---|
| **Databases** | | 10-I-DB-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Relational algebra and complex SQL statements; database planning and normal forms; transaction management.

**Intended learning outcomes**

The students possess knowledge about database modelling and queries in SQL as well as transactions.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 49 I Nr. 1 b)
§ 69 I Nr. 1 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Business Information Systems (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
Bachelor's degree (1 major) Functional Materials (2015)
First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Physics (2016)
Bachelor's degree (1 major) Business Information Systems (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)

Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Bachelor's degree (1 major) Business Information Systems (2019)
Bachelor's degree (1 major) Business Information Systems (2020)
Bachelor's degree (1 major) Aerospace Computer Science (2020)
Bachelor's degree (1 major) Functional Materials (2021)
Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Business Information Systems (2021)
Bachelor's degree (1 major) Mathematical Data Science (2022)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)
Bachelor's degree (1 major) Mathematics (2023)
Bachelor's degree (1 major) Business Information Systems (2023)
Bachelor's degree (1 major) Business Information Systems (2024)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024)
Bachelor's degree (1 major) Functional Materials (2025)
Bachelor's degree (1 major) Games Engineering (2025)

UNIVERSITÄT WÜRZBURG
Julius-Maximilians-

| Module title | | | Abbreviation |
|---|---|---|---|
| **Software Technology** | | | 10-I-ST-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 10 | numerical grade | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1 semester | undergraduate | -- | |

**Contents**

Object-oriented software development with UML, development of graphical user interfaces, foundations of data-bases and object-relational mapping, foundations of web programming (HTML, XML), software development processes, unified process, agile software development, project management, quality assurance.

**Intended learning outcomes**

The students possess a fundamental theoretical and practical knowledge on the design and development of software systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

300 h

**Teaching cycle**

Teaching cycle: only in summer semester

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 49 I Nr. 1 b)
§ 69 I Nr. 1 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Economathematics (2015)
Bachelor's degree (1 major) Human-Computer Systems (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major) Business Information Systems (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)

Bachelor's degree (1 major) Economathematics (2017)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Bachelor's degree (1 major) Business Information Systems (2019)
Module studies (Bachelor) Orientierungsstudien (2020)
Bachelor's degree (1 major) Business Information Systems (2020)
Bachelor's degree (1 major) Aerospace Computer Science (2020)
Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Business Information Systems (2021)
Bachelor's degree (1 major) Economathematics (2021)
Bachelor's degree (1 major) Economathematics (2022)
Bachelor's degree (1 major) Mathematics (2023)
Bachelor's degree (1 major) Business Information Systems (2023)
Bachelor's degree (1 major) Economathematics (2023)
Bachelor's degree (1 major) Business Information Systems (2024)
Bachelor's degree (1 major) Economathematics (2024)
Bachelor's degree (1 major) Digital Business & Data Science (2024)

| Module title | Abbreviation |
|---|---|
| **Algorithms and data structures** | 10-I-ADS-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 10 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Design and analysis of algorithms, recursion vs. iteration, sort and search methods, data structures, abstract data types, lists, trees, graphs, basic graph algorithms, programming in Java.

**Intended learning outcomes**

Students are proficient in independently designing, precisely describing and analyzing algorithms. The students know the basic paradigms for the design of algorithms and can implement them in practical programs. Students are able to estimate the runtime behavior of algorithms and prove the correctness of algorithms.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

300 h

**Teaching cycle**

Teaching cycle: only in winter semester

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 49 I Nr. 1 a)
§ 69 I Nr. 1 a)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Economathematics (2015)
Bachelor's degree (1 major) Human-Computer Systems (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)

Bachelor's degree (1 major) Computer Science (2019)
Bachelor's degree (1 major) Aerospace Computer Science (2020)
Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Mathematics (2023)

| Module title | | Abbreviation |
|---|---|---|
| **Practical Course in Programming** | | 10-I-PP-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 10 | (not) successfully completed | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1-2 semester | undergraduate | -- |

**Contents**

The programming language Java. Independent creation of small to middle-sized, high-quality Java programs.

**Intended learning outcomes**

The students are able to independently develop small to middle-sized, high-quality Java programs.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (6)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).

**Allocation of places**

--

**Additional information**

--

**Workload**

300 h

**Teaching cycle**

Teaching cycle: every semester

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 49 I Nr. 1 c)
§ 69 I Nr. 1 d)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Human-Computer Systems (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Functional Materials (2016)
Bachelor's degree (1 major) Computer Science (2017)
Master's degree (1 major) Functional Materials (2022)
Master's degree (1 major) Functional Materials (2025)

| Module title | Abbreviation |
|---|---|
| **Practical course in software** | 10-I-SWP-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 10 | (not) successfully completed | 10-I-PP, 10-I-ST |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | In addition, the knowledge and skills acquired in module 10-I-ADS are required. Prior attendance of this module is therefore highly recommended. |

**Contents**

Completion of a project assignment in groups, problem analysis, creation of requirements specifications, specification of solution components (e. g. UML) and milestones, user manual, programming documentation, presentation and delivery of the runnable software product in a colloquium.

**Intended learning outcomes**

The students possess the practical skills for the design, development and execution of a software project in small teams.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (6)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

practical project (Completion of a larger software project in groups (approx. 300 hours per person) and final presentation (approx. 10 minutes per group)

**Allocation of places**

--

**Additional information**

--

**Workload**

300 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 69 I Nr. 1 d)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Mathematics (2023)

| Module title | | Abbreviation |
|---|---|---|
| Technical Informatics I | | 10-I-TEl1-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

This course teaches the foundations of technical computer science.

**Intended learning outcomes**

The students master the fundamentals of technical computer science.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 69 I Nr. 1 c): Rechnernetze und Betriebssysteme

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

# Theoretical Computer Science

(10 ECTS credits)

| Module title | Abbreviation |
|---|---|
| **Theoretical Informatics** | 10-I-TIV-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Computability, decidability, countability, finite automata, regular sets, generative grammars, context-free languages, context-sensitive languages, complexity of calculations, P-NP problem, NP completeness.

**Intended learning outcomes**

The students possess a fundamental and applicable knowledge in the areas of computability, decidability, countability, finite automata, regular sets, generative grammars, context-free languages, context-sensitive languages, complexity of computations, P-NP problem, NP completeness.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 49 I Nr. 1 a)
§ 69 I Nr. 1 a)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Bachelor's degree (1 major) Aerospace Computer Science (2020)
Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)
Bachelor's degree (1 major) Mathematics (2023)

| Module title | Abbreviation |
|---|---|
| **Tutorial Theoretical Informatics** | 10-I-TIT-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 5 | (not) successfully completed | -- | |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Computability, decidability, countability, finite automata, regular sets, generative grammars, context-free languages, context-sensitive languages, complexity of calculations, P-NP problem, NP completeness.

**Intended learning outcomes**

The students possess a fundamental and applicable knowledge in the areas of computability, decidability, countability, finite automata, regular sets, generative grammars, context-free languages, context-sensitive languages, complexity of computations, P-NP problem, NP completeness.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) completion of approx. 11 exercises with approx. 4 components each (50% to be completed correctly) or
b) written examination (approx. 180 to 240 minutes)
Method of assessment to be selected by the candidate.

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 49 I Nr. 1 a)
§ 69 I Nr. 1 a)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)

# Compulsory Electives

(27 ECTS credits)

# Technical Computer Science

(5 ECTS credits)

| Module title | Abbreviation |
|---|---|
| **Computer Architecture** | 10-I-RAK-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Instruction set architectures, command processing through pipelining, statical and dynamic instruction scheduling, caches, vector processors, multi-core processors.

**Intended learning outcomes**

The students master the most important techniques to design fast computers as well as their interaction with compilers and operating systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)
§ 69 I Nr. 1 c): Rechnerarchitektur

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Physics (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Physics International (2020)

Bachelor's degree (1 major) Aerospace Computer Science (2020)

Bachelor's degree (1 major) Computer Science und Sustainability (2021)

Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)

Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)

Bachelor's degree (1 major) Mathematics (2023)

Master's degree (1 major) Physics International (2024)

Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Bachelor's degree (1 major) Games Engineering (2025)

| Module title | Abbreviation |
|---|---|
| **Digital computer systems** | 10-I-RALV-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | Simultaneous completion of module 10-I-RALT is recommended. |

**Contents**

Introduction to digital technologies, Boolean algebras, combinatory circuits, synchronous and asynchronous circuit hardware description languages, structure of a simple processor, machine programming, memory hierarchy.

**Intended learning outcomes**

The students possess a knowledge of the fundamentals of digital technologies up to the design and programming of easy microprocessors as well as knowledge for the application of hardware description languages for the design of digital systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)
§ 69 I Nr. 1 c): Rechnerarchitektur

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

# General Compulsory Electives

(22 ECTS credits)

| Module title | | Abbreviation |
|---|---|---|
| **Computer Architecture** | | 10-I-RAK-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Instruction set architectures, command processing through pipelining, statical and dynamic instruction scheduling, caches, vector processors, multi-core processors.

**Intended learning outcomes**

The students master the most important techniques to design fast computers as well as their interaction with compilers and operating systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)
§ 69 I Nr. 1 c): Rechnerarchitektur

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Physics (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Physics International (2020)

Bachelor's degree (1 major) Aerospace Computer Science (2020)

Bachelor's degree (1 major) Computer Science und Sustainability (2021)

Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)

Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)

Bachelor's degree (1 major) Mathematics (2023)

Master's degree (1 major) Physics International (2024)

Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Bachelor's degree (1 major) Games Engineering (2025)

| Module title | Abbreviation |
|---|---|
| **Digital computer systems** | 10-I-RALV-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 5 | numerical grade | -- | |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | Simultaneous completion of module 10-I-RALT is recommended. |

**Contents**

Introduction to digital technologies, Boolean algebras, combinatory circuits, synchronous and asynchronous circuit hardware description languages, structure of a simple processor, machine programming, memory hierarchy.

**Intended learning outcomes**

The students possess a knowledge of the fundamentals of digital technologies up to the design and programming of easy microprocessors as well as knowledge for the application of hardware description languages for the design of digital systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)
§ 69 I Nr. 1 c): Rechnerarchitektur

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

| Module title | Abbreviation |
|---|---|
| **Tutorial Digital computer systems** | 10-I-RALT-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science V | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 5 | (not) successfully completed | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1 semester | undergraduate | -- | |

**Contents**

Introduction to digital technologies, Boolean algebras, combinatory circuits, synchronous and asynchronous circuit hardware description languages, structure of a simple processor, machine programming, memory hierarchy.

**Intended learning outcomes**

The students possess a knowledge of the fundamentals of digital technologies up to the design and programming of easy microprocessors as well as knowledge for the application of hardware description languages for the design of digital systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) completion of approx. 11 exercises with approx. 4 components each (50% to be completed correctly) or
b) written examination (approx. 180 to 240 minutes)
Method of assessment to be selected by the candidate.

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

| Module title | | Abbreviation |
|---|---|---|
| Information Transmission | | 10-I-IÜ-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science III | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 10 | numerical grade | -- | |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Introduction to probability calculus, coding theory, coding for fault detection and fault correction, information theory, spectrum and Fourier transform, modulation technique, structure of digital transmission systems, introduction to the structure of computer networks, communication protocols.

**Intended learning outcomes**

The students possess a technical, theoretical and practical knowledge of the structure of systems for information transmission, a knowledge that is necessary to understand these systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

300 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)

| Module title | Abbreviation |
|---|---|
| **Practical course in hardware** | 10-I-HWP-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 10 | (not) successfully completed | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Practical experiments on hardware aspects, for example in communication technology, robots or the structure of a complete microprocessor.

**Intended learning outcomes**

The students are able to independently review, prepare and perform experiments with the help of experiment descriptions, to independently search for additional information as well as to document and evaluate experiment results.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (6)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

portfolio: completion of approx. 3 to 10 project assignments (approx. 250 hours total) and presentation of results (approx. 10 minutes per project)

**Allocation of places**

--

**Additional information**

--

**Workload**

300 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Module studies (Bachelor) Computer Science (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Bachelor's degree (1 major) Aerospace Computer Science (2020)

Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Mathematics (2023)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

| Module title | | Abbreviation |
|---|---|---|
| **Logic for informatics** | | 10-I-LOG-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Syntax and semantics of propositional logic, equivalence and normal forms, Horn formulas, SAT, resolution, infinite formula sets, syntax and semantics of predicate logic.

**Intended learning outcomes**

The students are proficient in the following areas: syntax and semantics of propositional logic, equivalence and normal forms, Horn formulas, SAT, resolution, infinite formula sets, syntax and semantics of predicate logic.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Bachelor's degree (1 major) Aerospace Computer Science (2020)

Bachelor's degree (1 major) Computer Science und Sustainability (2021)

Bachelor's degree (1 major) Mathematics (2023)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Bachelor's degree (1 major) Games Engineering (2025)

| Module title | Abbreviation |
|---|---|
| **Algorithmic Graph Theory** | 10-I-AGT-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science I | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

We discuss typical graph problems: We solve round trip problems, calculate maximal flows, find matchings and colourings, work with planar graphs and find out how the ranking algorithm of Google works. Using the examples of graph problems, we also become familiar with new concepts, for example how we model problems as linear programs or how we show that they are fixed parameter computable.

**Intended learning outcomes**

The students are able to model typical problems in computer science as graph problems. In addition, the participants are able to decide which tool from the course helps solve a given graph problem algorithmically. In this course, students learn in detail how to estimate the run time of given graph algorithms.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)

Bachelor's degree (1 major) Computer Science (2019)

Module studies (Bachelor) Computer Science (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Bachelor's degree (1 major) Aerospace Computer Science (2020)

Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)

Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)

Bachelor's degree (1 major) Mathematics (2023)

Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Bachelor's degree (1 major) Games Engineering (2025)

| Module title | | Abbreviation |
|---|---|---|
| **Interactive Computer Graphics** | | 10-I-ICG-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science IX | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Computer graphics studies methods for digitally synthesising and manipulating visual content. This course specifically concentrates on interactive graphics with an additional focus on 3D graphics as a requirement for many contemporary as well as for novel human-computer interfaces and computer games. The course will cover topics about light and images, lighting models, data representations, mathematical formulations of movements, projection as well as texturing methods. Theoretical aspects of the steps involved in ray-tracing and the raster pipeline will be complemented by algorithmical approaches for interactive image syntheses using computer systems. Accompanying software solutions will utilise modern graphics packages and languages like OpenGL, GLSL and/or DirectX.

**Intended learning outcomes**

At the end of the course, the students will have a broad understanding of the underlying theoretical models of computer graphics. They will be able to implement a prominent variety of these models, to build their own interactive graphics applications and to choose the right software tool for this task.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

| Module title | | Abbreviation |
|---|---|---|
| **Knowledge-based Systems** | | 10-I-WBS-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science VI | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Foundations in the following areas: knowledge management systems, knowledge representation, solving methods, knowledge acquisition, learning, guidance dialogue, semantic web.

**Intended learning outcomes**

The students possess theoretical and practical knowledge for the understanding and design of knowledge-based systems including knowledge formalisation and have acquired experience in a small project.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Business Information Systems (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major) Business Information Systems (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)

Bachelor's degree (1 major) Computer Science (2019)
Bachelor's degree (1 major) Business Information Systems (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Bachelor's degree (1 major) Business Information Systems (2020)
Bachelor's degree (1 major) Aerospace Computer Science (2020)
Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Business Information Systems (2021)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)
Bachelor's degree (1 major) Mathematics (2023)
Bachelor's degree (1 major) Business Information Systems (2023)
Bachelor's degree (1 major) Business Information Systems (2024)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Bachelor's degree (1 major) Games Engineering (2025)

| Module title | | Abbreviation |
|---|---|---|
| Data Mining | | 10-I-DM-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science VI | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Foundations in the following areas: definition of data mining and knowledge, discovery in databases, process model, relationship to data warehouse and OLAP, data preprocessing, data visualisation, unsupervised learning methods (cluster and association methods), supervised learning (e. g. Bayes classification, KNN, decision trees, SVM), learning methods for special data types, other learning paradigms.

**Intended learning outcomes**

The students possess a theoretical and practical knowledge of typical methods and algorithms in the area of data mining and machine learning. They are able to solve practical knowledge discovery problems with the help of the knowledge acquired in this course and by using the KDD process. They have acquired experience in the use or implementation of data mining algorithms.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Business Information Systems (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major) Business Information Systems (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Bachelor's degree (1 major) Business Information Systems (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Bachelor's degree (1 major) Business Information Systems (2020)
Bachelor's degree (1 major) Aerospace Computer Science (2020)
Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Business Information Systems (2021)
Master's degree (1 major) Information Systems (2022)
Bachelor's degree (1 major) Mathematics (2023)
Bachelor's degree (1 major) Business Information Systems (2023)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

| Module title | | Abbreviation |
|---|---|---|
| **Object oriented Programming** | | 10-I-OOP-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Polymorphism, generic programming, meta programming, web programming, templates, document management.

**Intended learning outcomes**

The students are proficient in the different paradigms of object-oriented programming and have experience in their practical use.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Business Information Systems (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Physics (2016)
Master's degree (1 major) Nanostructure Technology (2016)
Bachelor's degree (1 major) Business Information Systems (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Bachelor's degree (1 major) Business Information Systems (2019)

| Module title | Abbreviation |
|---|---|
| **Computational Complexity** | 10-I-KT-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 5 | numerical grade | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1 semester | undergraduate | -- | |

**Contents**

Complexity measurements and classes, general relationships between space and time classes, memory consumption versus computation time, determinism versus indeterminism, hierarchical theorems, translation methods, P-NP problem, completeness problems, Turing reduction, interactive proof systems.

**Intended learning outcomes**

The students possess a fundamental and applicable knowledge in the areas of complexity measurements and classes, general relationships between space and time classes, memory consumption versus computation time, determinism versus indeterminism, hierarchical theorems, translation methods, P-NP problem, completeness problems, Turing reduction, interactive proof systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Computer Science (2017)

| Module title | Abbreviation |
|---|---|
| **Cryptography and Data Security** | 10-I-KD-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Private key cryptography systems, Vernam one-time pad, AES, perfect security, public key cryptography systems, RSA, Diffie-Hellman, Elgamal, Goldwasser-Micali, digital signature, challenge-response methods, secret sharing, millionaire problem, secure circuit evaluation, homomorphous encryption.

**Intended learning outcomes**

The students possess a fundamental and applicable knowledge in the areas of private key cryptography systems, Vernam one-time pad, AES, perfect security, public key cryptography, RSA, Diffie-Hellman, Elgamal, Goldwasser-Micali, digital signature, challenge-response method, secret sharing, millionaire problem, secure circuit evaluation, homomorphous encryption

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Computer Science (2017)

| Module title | | Abbreviation |
|---|---|---|
| **3D Point Cloud Processing** | | 10-I-3D-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science XVII | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Laser scanning, Kinect and camera models, basic data structures (lists, arrays, oc-trees), calculating normals, k-d trees, registration, features, segmentation, tracking, applications for airborne mapping, applications to mobile mapping.

**Intended learning outcomes**

Students understand the fundamental principles of all aspects of 3D point cloud processing and are able to communicate with engineers / surveyors / CV people / etc. Students are able to solve problems of modern sensor data processing and have experienced that real application scenarios are challenging in terms of computational requirements, in terms of memory requirements and in terms of implementation issues.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)

Bachelor's degree (1 major) Computer Science (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Bachelor's degree (1 major) Aerospace Computer Science (2020)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)
Bachelor's degree (1 major) Mathematics (2023)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Bachelor's degree (1 major) Games Engineering (2025)

| Module title | | Abbreviation |
|---|---|---|
| **Computer Networks and Communication Systems** | | 10-I-RK-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science III | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 8 | numerical grade | -- | |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Properties of computer and communication systems: data traffic in distributed systems. Performance analysis of computer networks and communication systems: problem statement and introduction to method architecture and structure of computer networks: network structure, network access, access methods, digital transfer hierarchies, dataflow control and traffic control, transfer network. Communication protocols: fundamental principles and ISO architecture models. Internet: structure and basic mechanism, TCP/IP, routing, network management. Mobile communication networks: fundamental concepts, GSM, UMTS. Future communication systems and networks.

**Intended learning outcomes**

The students possess an intricate knowledge of the structure of computer networks and communication systems as well as fundamental principles to rate these systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

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**Workload**

240 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Bachelor's degree (1 major) Aerospace Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2017)

| Module title | | Abbreviation |
|---|---|---|
| Seminar - Selected Topics in Computer Science 1 | | 10-I-SEM1-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Independent review of a current topic in computer science on the basis of literature and, where applicable, software with written and oral presentation. The topics in modules 10-I-SEM1 and 10-I-SEM2 must come from different areas (this usually means that they are assigned by different lecturers).

**Intended learning outcomes**

The students are able to independently review a current topic in computer science, to summarise the main aspects in written form and to orally present these in an appropriate way.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written elaboration (approx. 10 to 15 pages) and presentation (approx. 30 to 45 minutes) with subsequent discussion on a topic from the field of computer science
Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
Bachelor's degree (1 major) Business Information Systems (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major) Business Information Systems (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Module studies (Bachelor) Computer Science (2019)
Bachelor's degree (1 major) Business Information Systems (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Bachelor's degree (1 major) Business Information Systems (2020)

Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Business Information Systems (2021)
Bachelor's degree (1 major) Business Information Systems (2023)
Bachelor's degree (1 major) Business Information Systems (2024)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

| Module title | Abbreviation |
|---|---|
| Project Presentation | 10-I-PV-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

## Contents

Presentation of a project developed by the student (e. g. Bachelor's thesis, software project) analogous to a presentation for laypersons with a knowledge of computer science at a trade fair. The project, which may also be work-in-progress, is presented with the help of a poster, a short talk and optionally a live demonstration.

## Intended learning outcomes

The students are able to present a project they developed and to create the required media.

## Courses (type, number of weekly contact hours, language — if other than German)

S (5)

## Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation of a project developed by the candidate analogous to a presentation for laypersons with a knowledge of computer science at a trade fair as well as discussion (approx. 10 to 15 minutes total)
Language of assessment: German and/or English

## Allocation of places

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## Additional information

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## Workload

150 h

## Teaching cycle

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## Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

## Module appears in

Bachelor's degree (1 major) Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

| Module title | | Abbreviation |
|---|---|---|
| **Advanced Automation** | | 10-I=AA-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science VII | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 8 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Advanced topics in automation systems as well as instrumentation and control engineering, for example from the field of sensor data processing, actuators, cooperating systems, mission and trajectory planning.

**Intended learning outcomes**

The students have an advanced knowledge of selected topics in automation systems. They are able to implement advanced automation systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes)
creditable for bonus

**Allocation of places**

--

**Additional information**

Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): IT,IS,ES,LR,GE

**Workload**

240 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Master's degree (1 major) Space Science and Technology (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Computer Science (2016)
Master's degree (1 major) Mathematics (2016)
Master's degree (1 major) Computational Mathematics (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Master's degree (1 major) Computer Science (2017)
Master's degree (1 major) Computer Science (2018)
Module studies (Master) Computer Science (2019)
Master's degree (1 major) Computational Mathematics (2019)
Master's degree (1 major) Mathematics (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Computational Mathematics (2022)
Master's degree (1 major) Mathematics (2022)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

| Module title | | Abbreviation |
|---|---|---|
| **Algorithms for Geographic Information Systems** | | 10-I=AGIS-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science I | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Algorithmic foundations of geographic information systems and their application in selected problems of acquisition, processing, analysis and presentation of spatial information. Processes of discrete and continuous optimisation. Applications such as the creation of digital height models, working with GPS trajectories, tasks of spatial planning as well as cartographic generalisation.

**Intended learning outcomes**

The students are able to formalise algorithmic problems in the field of geographic information systems as well as to select and improve suitable approaches to solving these problems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| Computational Geometry | | 10-I=AG-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science I | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

In many areas of computer science -- for example robotics, computer graphics, virtual reality and geographic information systems -- it is necessary to store, analyse, create or manipulate spatial data. This class is about the algorithmic aspects of these tasks: We will acquire techniques that are needed to plan and analyse geometric algorithms and data structures. Every technique will be illustrated with a problem in the practical areas listed above.

**Intended learning outcomes**

The students are able to decide which algorithms or data structures are suitable for the solution of a given geometric problem. The students are able to analyse new problems and to come up with their own efficient solutions based on the concepts and techniques acquired in the lecture.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Approximation Algorithms** | | 10-I=APA-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science I | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

## Contents

The task of finding the optimal solution for a given problem is omnipresent in computer science. Unfortunately, there are many problems without an efficient algorithm for an optimal solution. As a result, in practice, methods are used which do not always give the optimal solution but always give good solutions. This lecture will discuss drafting and analysing techniques for algorithms which have a proven approximation quality. With the help of practical optimisation problems, the lecture will introduce students to important drafting techniques such as greedy, local search, scaling as well as methods based on linear programming.

## Intended learning outcomes

The students are able to analyse easy approximation methods in terms of their quality. They understand fundamental drafting techniques such as greedy, local search and scaling as well as methods based on linear programming and are able to apply these to new problems.

## Courses (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

## Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

## Allocation of places

--

## Additional information

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## Workload

150 h

## Teaching cycle

--

## Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

## Module appears in

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Automata Theory** | | 10-I=AUT-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Finite automata, regular languages, star-free languages, natural equivalence relations, predicate logic with words, language acceptance through monoids, syntactic monoid, predicate logical and algebraic characterisation of regular languages and star-free languages, two-way automata.

**Intended learning outcomes**

The students possess a fundamental and applicable knowledge in the areas of finite automata, regular languages, star-free languages, natural equivalence relations, predicate logic with words, language acceptance through monoids, syntactic monoid, predicate logical and algebraic characterisation of regular and star-free languages, two-way automata.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| Avionics Systems | | 10-I=AVS-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science VIII | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 5 | numerical grade | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1 semester | graduate | -- | |

**Contents**

The course *Avionik-Systeme* (*Avionics Systems*) offers an overview of software, hardware, sensors, actuators and communication of airplanes and satellites: 1. software module and the software structure 2. control 3. ground control, 4. sensors and actuators, 5. sensor fusion, 6. reliability

**Intended learning outcomes**

At the end of the course, the students should be familiar with typical structures of avionic systems for satellites and airplanes. They should be able to design these. They should be able to program simple controls.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Computability Theory** | | 10-I=BER-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Gödel numbering, computable functions, decidable and countable sets, halting problem, m-reducibility, creative and productive sets, relative computability, Turing reduction, countable degrees, arithmetic hierarchy.

**Intended learning outcomes**

The students possess a fundamental and applicable knowledge in the areas of Gödel numbers, countable functions, decidable and countable sets, halting problem, m-reducibility, creative and productive sets, relative computability, Turing reduction, countable degrees, arithmetic hierarchy.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| Compiler Construction | | 10-I=CB-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science II | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Lexical analysis, syntactic analysis, semantics, compiler generators, code generators, code optimisation.

**Intended learning outcomes**

The students possess knowledge in the formal description of programming languages and their compilation. They are able to perform transformations between them with the help of finite automata, push-down automata and compiler generators.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **E-Learning** | | 10-I=EL-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science VI | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Learning paradigms, learning system types, author systems, learning platforms, standards for learning systems, intelligent tutoring systems, student models, didactics, problem-oriented learning and case-based training systems, adaptive tutoring systems, computer-supported cooperative learning, evaluation of learning systems.

**Intended learning outcomes**

The students possess a theoretical and practical knowledge about eLearning and are able to assess possible applications.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Business Information Systems (2016)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Embedded Systems** | | | 10-I=ES-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | | Only after succ. compl. of module(s) |
|---|---|---|---|
| 8 | numerical grade | | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Models of embedded systems, implementation methods (ASIC, AISIP, micro controller), verification of embedded systems, implementation planning static, periodic and dynamic, binding problems, hardware synthesis, software synthesis.

**Intended learning outcomes**

The students are familiar with the technical possibilities for the design of embedded systems and master the most important techniques for the modelling, verification and optimisation of such systems in hardware and software.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

240 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Analysis and Design of Programs** | | 10-I=PA-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science II | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Program analysis, model creation in software engineering, program quality, test of programs, process models.

**Intended learning outcomes**

The students are able to analyse programs, to use testing frameworks and metrics as well as to judge program quality.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Business Information Systems (2016)

| Module title | Abbreviation |
|---|---|
| **Information Retrieval** | 10-I=IR-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

IR models (e. g. Boolean and vector space model, evaluation), processing of text (tokenising, text properties), data structures (e. g. inverted index), query elements (e. g. query operations, relevance feedback, query languages and paradigms, structured queries), search engine (e. g. architecture, crawling, interfaces, link analysis), methods to support IR (e. g. recommendation systems, text clustering and classification, information extraction).

**Intended learning outcomes**

The students possess theoretical and practical knowledge in the area of information retrieval and have acquired the technical know-how to create a search engine.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Business Information Systems (2016)

| Module title | | Abbreviation |
|---|---|---|
| Computational Complexity II | | 10-I=KT2-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Properties of NP-complete sets, autoreducibility, interactive proof systems, polynomial time hierarchy, complexity of probabilistic algorithms.

**Intended learning outcomes**

The students possess a fundamental and applicable knowledge in the areas of properties of NP-complete sets, autoreducibility, interactive proof systems, polynomial time hierarchies, complexity of probabilistic algorithms.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Artificial Intelligence I** | | 10-I=KI1-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science VI | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Intelligent agents, uninformed and heuristic search, constraint problem solving, search with partial information, propositional and predicate logic and inference, knowledge representation.

**Intended learning outcomes**

The students possess theoretical and practical knowledge about artificial intelligence in the area of agents, search and logic and are able to assess possible applications.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Business Information Systems (2016)

| Module title | | Abbreviation |
|---|---|---|
| **Artificial Intelligence 2** | | 10-I=KI2-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science VI | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Planning, probabilistic closure and Bayesian networks, utility theory and decidability problems, learning from observations, knowledge while learning, neural networks and statistical learning methods, reinforcement learning, processing of natural language, image processing.

**Intended learning outcomes**

The students possess theoretical and practical knowledge about artificial intelligence in the area of probabilistic closure, learning and language/image processing and are able to assess possible applications.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Business Information Systems (2016)

| Module title | | Abbreviation |
|---|---|---|
| Performance Evaluation of Distributed Systems | | 10-I=LVS-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science III | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 8 | numerical grade | -- | |
| Duration | Module level | Other prerequisites | |
| 1 semester | graduate | -- | |

**Contents**

Electronic patient folder, coding of medical data, hospital information systems, medical decision making and assistance systems, statistics and data mining in medical research, case-based training systems in medical training, medical data warehouse, image and text processing in medicine.

**Intended learning outcomes**

The students possess the methodic knowledge and the practical skills necessary to model technical systems by means of the theory of probability and mathematical statistics.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

240 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | Abbreviation |
|---|---|
| **Mathematical Logic** | 10-I=ML-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Propositional logic, first-order predicate logic, proof and deduction, Gödel's completeness theorem, Tarski theorem, Gödel's incompleteness theorem, undecidability and nonaxiomatisability of elemental arithmetic.

**Intended learning outcomes**

The students possess a fundamental and applicable knowledge in the areas of propositional logic, first-order predicate logic, proof and deduction, Gödel's completeness theorem, Tarski theorem, Gödel's incompleteness theorem, undecidability and nonaxiomatisability of elemental arithmetic.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Medical Informatics** | | 10-I=MI-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science VI | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Electronic patient folder, coding of medical data, hospital information systems, operation of computers in infirmary and functional units, medical decision making and assistance systems, statistics and data mining in medical research, case-based training systems in medical training.

**Intended learning outcomes**

The students possess theoretical and practical knowledge about the application of computer science methods in medicine.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Performance Engineering & Benchmarking of Computer Systems** | | 10-I=PEB-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science II | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

| Contents |
|---|
| Introduction to performance engineering of commercial software systems, performance measurement techniques, benchmarking of commercial software systems, modelling for performance prediction, case studies. |

| Intended learning outcomes |
|---|
| The students possess a fundamental and applicable knowledge in the areas of performance metrics, measurement techniques, multi-factorial variance analysis, data analysis with R, benchmark approaches, modelling with queue networks, modelling methods, resource demand approximation, petri nets. |

| Courses (type, number of weekly contact hours, language — if other than German) |
|---|
| V (2) + Ü (2) |

| Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus) |
|---|
| written examination (approx. 60 to 120 minutes). <br> If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate). <br> Language of assessment: German and/or English <br> creditable for bonus |

| Allocation of places |
|---|
| -- |

| Additional information |
|---|
| -- |

| Workload |
|---|
| 150 h |

| Teaching cycle |
|---|
| -- |

| Referred to in LPO I (examination regulations for teaching-degree programmes) |
|---|
| § 22 II Nr. 3 b) |

| Module appears in |
|---|
| First state examination for the teaching degree Gymnasium Computer Science (2015) |

| Module title | | Abbreviation |
|---|---|---|
| **Professional Project Management** | | 10-I=PM-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science III | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | Simultaneous completion of module 10-I=PRJ is recommended. |

### Contents

Project goals, project assignment, project success criteria, business plan, environment analysis and stakeholder management, initialisation, definition, planning, execution/control, finishing of projects, reporting, project communication and marketing, project organisation, team building and development, opportunity and risk management; conflict and crisis management, change and claim management; contract and procurement management, quality management, work techniques, methods and tools; leadership and social skills in project management, program management, multiproject management, project portfolio management, PMOs; peculiarities of software projects; agile project management/SCRUM, combination of classic and agile methods.

### Intended learning outcomes

The students possess practically relevant knowledge about the topics of production management and/or professional project management. They are familiar with the critical success criteria and are able to initiate, define, plan, control and review projects.

### Courses (type, number of weekly contact hours, language — if other than German)

V (2)

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

### Allocation of places

--

### Additional information

--

### Workload

150 h

### Teaching cycle

--

### Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

### Module appears in

Master's degree (1 major) Media Communication (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Computer Arithmetic** | | 10-I=RAM-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science II | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Spaces of numerical computation, raster and rounding, definition and implementation of computational arithmetic and interval calculation.

**Intended learning outcomes**

The students possess knowledge about the spaces of numerical computation, raster and roundings, definition and implementation of computational arithmetic and interval calculation. They master the application of algorithms.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Robotics 1** | | 10-I=RO1-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science XVII | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 8 | numerical grade | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1 semester | graduate | -- | |

### Contents

History, applications and properties of robots, direct kinematics of manipulators: coordinate systems, rotations, homogenous coordinates, axis coordinates, arm equation. Inverse kinematics: solution properties, end effector configuration, numerical and analytical approaches, examples of different robots for analytical approaches. Workspace analysis and trajectory planning, dynamics of manipulators: Lagrange-Euler model, direct and inverse dynamics. Mobile robots: direct and inverse kinematics, propulsion system, tricycle, Ackermann steering, holonomes and non-holonome restrictions, kinematic classification of mobile robots, posture kinematic model. Movement control and path planning: roadmap methods, cell decomposition methods, potential field methods. Sensors: position sensors, speed sensors, distance sensors.

### Intended learning outcomes

The students master the fundamentals of robot manipulators and vehicles and are, in particular, familiar with their kinematics and dynamics as well as the planning of paths and task execution.

### Courses (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 90 minutes)
creditable for bonus

### Allocation of places

--

### Additional information

Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): IS,ES,LR,HCI

### Workload

240 h

### Teaching cycle

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

### Module appears in

Master's degree (1 major) Space Science and Technology (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Computer Science (2016)
Master's degree (1 major) Mathematics (2016)
Master's degree (1 major) Computational Mathematics (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Master's degree (1 major) Computer Science (2017)
Master's degree (1 major) Satellite Technology (2018)

Master's degree (1 major) Computational Mathematics (2019)
Master's degree (1 major) Mathematics (2019)

| Module title | | Abbreviation |
|---|---|---|
| **Robotics 2** | | 10-I=RO2-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science XVII | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 8 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Foundations of dynamic systems, controllability and observability, controller design through pole assignment: feedback and feed-forward, state observer, feedback with state observer, time discrete systems, stochastic systems: foundations of stochastics, random processes, stochastic dynamic systems, Kalman filter: derivation, initialising, application examples, problems of Kalman filters, extended Kalman filter.

**Intended learning outcomes**

The students master all fundamentals that are necessary to understand Kalman filters and their use in applications of robotics. The students possess a knowledge of advanced controller and observer methods and recognise the connections between the dual pairs controllability - observability as well as controller design and observer design. They also recognise the relationship between the Kalman filter as a state estimator and an observer.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 90 minutes)
creditable for bonus

**Allocation of places**

--

**Additional information**

Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): IT, ES, LR

**Workload**

240 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Master's degree (1 major) Space Science and Technology (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Computer Science (2016)
Master's degree (1 major) Mathematics (2016)
Master's degree (1 major) Computational Mathematics (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Master's degree (1 major) Computer Science (2017)
Master's degree (1 major) Computer Science (2018)
Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

| Module title | Abbreviation |
|---|---|
| **Discrete Event Simulation** | 10-I=ST-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science III | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 8 | numerical grade | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1 semester | graduate | -- | |

**Contents**

Introduction to simulation techniques, statistical groundwork, creation of random numbers and random variables, random sample theory and estimation techniques, statistical analysis of simulation values, inspection of measured data, planning and evaluation of simulation experiments, special random processes, possibilities and limits of model creation and simulation, advanced concepts and techniques, practical execution of simulation projects.

**Intended learning outcomes**

The students possess the methodic knowledge and the practical skills necessary for the stochastic simulation of (technical) systems, the evaluation of results and the correct assessment of the possibilities and limits of simulation methods.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

240 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Spacecraft System Design** | | 10-I=SSD-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science VII | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 8 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Introduction: history of space flight, system design of spacecraft. Space dynamics: two-body dynamics, Kepler orbits, disturbance forces, transfer orbits. Mission analysis: earth and sun-synchronous orbits, shadows, solar angle of incidence. Thermal control of satellites: thermal analysis, thermal design and technologies, verification of thermal designs. Telecommunication: ground contact analysis, data transmission, satellite monitoring (telemetry, telecommando). Structure and mechanisms. Energy systems: primary, secondary, management, power generation: solar cells. On-board data processing. Propulsion systems. Tests (mechanical, electrical). Operation of spacecraft. Ground segment.

**Intended learning outcomes**

The students master system aspects of the layouting of technical systems. Using the example of spacecraft, major subsystems and their integration into a working whole are being analysed.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes)
creditable for bonus

**Allocation of places**

--

**Additional information**

Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): ES, LR

**Workload**

240 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Master's degree (1 major) Space Science and Technology (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's degree (1 major) Computer Science (2016)
Master's degree (1 major) Computer Science (2017)
Master's degree (1 major) Computer Science (2018)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Master's degree (1 major) Computer Science (2021)

| Module title | | Abbreviation |
|---|---|---|
| **Visualization of Graphs** | | 10-I=VG-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science I | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

### Contents

This course covers the most important algorithms to draw graphs. Methods from the course *Algorithmische Graphentheorie* (*Algorithmic Graph Theory*) such as divide and conquer, flow networks, integer programming and the planar separator theorem will be used. We will become familiar with measures of quality of a graph drawing as well as algorithms to optimise these measures.

### Intended learning outcomes

The participants get an overview of graph visualisation and become familiar with typical tools. They consolidate their knowledge about the modelling and solving of problems with the help of graphs and graph algorithms.

### Courses (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

### Allocation of places

--

### Additional information

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### Workload

150 h

### Teaching cycle

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

### Module appears in

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | Abbreviation |
|---|---|
| Selected Topics in Algorithms and Theory | 10-I=AKAT-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science I | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 5 | numerical grade | -- | |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Selected topics in algorithmics and theory.

**Intended learning outcomes**

The students understand the basic approach of algorithmic and theoretical computer science. They are able to understand the solutions to complex problems in this area and to apply them to similar questions.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

| Module title | Abbreviation |
|---|---|
| **Selected Topics in Software Engineering** | 10-I=AKSE-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science II | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 5 | numerical grade | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1 semester | graduate | -- | |

| Contents |
|---|
| Selected topics in software engineering. |

| Intended learning outcomes |
|---|
| The students possess an advanced knowledge about selected aspects of software engineering. |

| Courses (type, number of weekly contact hours, language — if other than German) |
|---|
| V (2) + Ü (2) |

| Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus) |
|---|
| written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus |

| Allocation of places |
|---|
| -- |

| Additional information |
|---|
| -- |

| Workload |
|---|
| 150 h |

| Teaching cycle |
|---|
| -- |

| Referred to in LPO I (examination regulations for teaching-degree programmes) |
|---|
| § 22 II Nr. 3 b) |

| Module appears in |
|---|
| First state examination for the teaching degree Gymnasium Computer Science (2015) |

| Module title | | Abbreviation |
|---|---|---|
| **Selected Topics in Internet Technologies** | | 10-I=AKIT-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science III | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Selected topics in computer communication, for example design aspects of future internet structures: setup and control structures of the internet, multicast protocols, protocols for multimedia communication, optical networks, control mechanisms for redundant and real-time communication networks, p2p networks, ad-hoc networks, or -- new concepts and technologies in mobile communication: digital modulation, signal propagation, channel coding, modern transmission technologies (adaptive modulation and coding, hybrid ARQ, OFDM, MIMO), mac layer, mobileIP, routing in ad-hoc networks, vertical handover, UMTS IP multimedia subsystem, or -- planning and management methods in telecommunication networks: planning methods (forward engineering, reverse engineering), network management paradigms (central and decentral), framework for network management (IETF traffic engineering, ITU-T TMN, OSI management), planning and management methods (IP management mechanisms, network design, measurement, acquisition and evaluation of traffic and performance data, visualisation, result handling, simulation and analysis of networks), management tools, outlook and perspectives, or -- other current topics.

**Intended learning outcomes**

The students have a knowledge of advanced and current topics in the management and design of modern wired and wireless communication systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Selected Topics in Intelligent Systems** | | 10-I=AKIS-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science VI | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

| Contents |
|---|
| Selected topics in intelligent systems. |

| Intended learning outcomes |
|---|
| The students possess an advanced knowledge in the area of intelligent systems. They are able to understand solutions to complex problems in this area and to transfer them to related questions. |

| Courses (type, number of weekly contact hours, language — if other than German) |
|---|
| V (2) + Ü (2) |

| Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus) |
|---|
| written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus |

| Allocation of places |
|---|
| -- |

| Additional information |
|---|
| -- |

| Workload |
|---|
| 150 h |

| Teaching cycle |
|---|
| -- |

| Referred to in LPO I (examination regulations for teaching-degree programmes) |
|---|
| § 22 II Nr. 3 b) |

| Module appears in |
|---|
| First state examination for the teaching degree Gymnasium Computer Science (2015) |

| Module title | Abbreviation |
|---|---|
| Selected Topics in Embedded Systems | 10-I=AKES-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Selected topics in embedded systems.

**Intended learning outcomes**

The students possess specialised knowledge in the area of embedded systems. They are able to understand solutions to complex problems in this area and to transfer them to related questions.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| Selected Topics in Aerospace Engineering | | 10-I=AKLR-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science VIII | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Selected topics in aerospace engineering, for example: satellite communication, rocket science, propulsion systems, sensors and actuators for orientation control, perturbation of orbits, interplanetary orbits, rendezvous and docking, design of space ships, design of planetary bases, life support systems, special aspects of operations, payloads, optical systems, RADAR, earth monitoring, thermo management, structure of space ships, special areas of navigation, space environment, environment simulation, verification and test of space faring systems, space astronomy and planet missions, space medicine and biology, material science, quality management, space law, aeroflight topics, avionics for airplanes, air traffic control, areal navigation, pilot interfaces, air traffic control, air traffic management.

**Intended learning outcomes**

The students possess an advanced knowledge about the respective topic of the selected area and are able to consider these foundations in their future plans of air or spaceborne systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| Selected Topics in HCI | | 10-I=AKHCI-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science IX | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Selected topics in HCI.

**Intended learning outcomes**

The students understand the basic approach of human-computer interaction. They are able to understand the solutions to complex problems in this area and to transfer them to related questions.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| Selected Topics in Computer Science | | 10-I=AKII-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Selected topics in computer science.

**Intended learning outcomes**

The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Multimodal User Interfaces** | | 06-HCI=BS-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| holder of the Chair of Computer Science IX | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

The multimodal interaction paradigm simultaneously uses various modalities like speech, gesture, touch, or gaze, to communicate with computers and machines. Basically, multimodal interaction includes the analysis as well as the synthesis of multimodal utterances. This course concentrates on the analysis, i.e., the input processing. Input processing has the goal to derive meaning from signal to provide a computerized description and understanding of the input and to execute the desired interaction. In multimodal systems, this process is interleaved between various modalities and multiple interdependencies exist between simultaneous utterances necessary to take into account for a successful machine interpretation.
In this course, students will learn about the necessary steps involved in processing unimodal as well as multimodal input. The course will highlight typical stages in multimodal processing. Using speech processing as a primary example, they learn about:
1. A/D conversion
2. Segmentation
3. Syntactical analysis
4. Semantic analysis
5. Pragmatic analysis
6. Discourse analysis
A specific emphasize will be on stages like morphology and semantic analysis. Typical aspects of multimodal interdependencies, i.e., temporal and semantic interrelations are highlighted and consequences for an algorithmic processing are derived. Prominent multimodal integration (aka multimodal fusion) approaches are described, including transducers, state machines, and unification.

**Intended learning outcomes**

After the course, the students will be able to build their own multimodal interfaces. They will have a broad understanding of all the necessary steps involved and will know prominent algorithmic solutions for each of them. Student will learn about available tools for reoccurring tasks and their pros and cons.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation of project results
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

| Referred to in LPO I (examination regulations for teaching-degree programmes) |
|---|
| § 22 II Nr. 3 b) |
| **Module appears in** |
| First state examination for the teaching degree Gymnasium Computer Science (2015) |
| Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) |
| Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) |

| Module title | Abbreviation |
|---|---|
| **Introduction into Human-Computer Interaction** | 06-HCI=Einf-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science IX | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Human-Computer Interaction is concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. This course gives an introduction into the principle biological, physiological, and psychological constraints as defined by the human user and relates these constraints to the conceptual and technical solutions of today's computer systems and existing as well as prospective interaction metaphors between humans and computers.
The course covers topics about human perception and cognition, memory and attention, the design of interactive systems, prominent evaluation methods, the principles of computer systems, typical input processing techniques, interface technology, and examples of typical interaction metaphors, from text-based input to graphical desktops to multimodal interfaces. Accompanying lab-work will introduce students to typical tasks involved in this field, i.e., prominent evaluation methods and prototyping of interfaces.

**Intended learning outcomes**

After the course, the students will have a broad understanding of the underlying principles of human users and computer systems. They will understand the constraints and capabilities of current user interfaces and they will learn about the necessary steps applied in user-centered design and development approaches.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation of project results
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

| Module title | Abbreviation |
|---|---|
| **3D User Interfaces** | 06-HCI=IS-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science IX | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

This module will give students the opportunity to learn about the specificities of 3D User Interfaces (3DUI) development using Virtual, Augmented or Mixed Reality technologies. The module content will be mainly dedicated to learn and practice the skills essential to the design and implementation of high-quality 3D interaction techniques. Design guidelines as well as classical and innovative 3D Interaction techniques will be studied. In addition, the course will address novel research themes such as 3D interaction for large displays and games; and integrating 3DUIs with mobile devices, robotics, and the environment. Students will be assessed through a group practical project (team work), which will consist of a program, a presentation, a technical report (2 ages) and a video. Previous years, the assignment replicated the IEEE 3DUI Contest 2011, where teams of students competed between each other to find the best solution (see results at https://www.youtube.com/watch?v=gYs-pBW7Agc and https://www.youtube.com/watch?v=gYs-pBW7Agc)

**Intended learning outcomes**

After the course, the students will gain a solid background on the theory and the methods to create your own 3D spatial interfaces. They will have a broad understanding of the particular difficulties of designing and developing spatial interfaces, as well as evaluating then. Students will also learn about traditional and novel 3D input/output devices (e.g, motion tracking system and Head-mounted Display).

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation of project results
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

| Module title | Abbreviation |
|---|---|
| **Real-Time Interactive Systems** | 06-HCI=ST-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Chair of Computer Science IX | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 5 | numerical grade | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1 semester | graduate | -- | |

**Contents**

This course provides an introduction into the requirements, concepts, and engineering art of highly interactive human-computer systems. Such systems are typically found in perceptual computing, Virtual, Augmented, Mixed Reality, computer games, and cyber-physical systems. Lately, these systems are often termed Real-Time Interactive Systems (RIS) due to their common aspects.
The course covers theoretical models derived from the requirements of the application area as well as common hands-on and novel solutions necessary to tackle and fulfill these requirements. The first part of the course will concentrate on the conceptual principles characterizing real-time interactive systems. Questions answered are: What are the main requirements? How do we handle multiple modalities? How do we define the timeliness of RIS? Why is it important? What do we have to do to assure timeliness? The second part will introduce a conceptual model of the mission-critical aspects of time, latencies, processes, and events necessary to describe a system's behavior. The third part introduces the application state, it's requirements of distribution and coherence, and the consequences these requirements have on decoupling and software quality aspects in general. The last part introduces some potential solutions to data redundancy, distribution, synchronization, and interoperability. Along the way, typical and prominent state-of-the-art approaches to reoccurring engineering tasks are discussed. This includes pipeline systems, scene graphs, application graphs (aka field routing), event systems, entity and component models, and others. Novel concepts like actor models and ontologies will be covered as alternative solutions. The theoretical and conceptual discussions will be put into a practical context of today's commercial and research systems, e.g., X3D, instant reality, Unity3d, Unreal Engine 4, and Simulator X.

**Intended learning outcomes**

After the course, the students will have a solid understanding of the boundary conditions defined by both, the physiological and psychological characteristics of the human users as well as by the architectures and technological characteristics of today's computer systems. Participants will gain a solid understanding about what they can expect from today's technological solutions. They will be able to choose the appropriate approach and tools to solve a given engineering task in this application area and they will have a well-founded basis enabling them to develop alternative approaches for future real-time interactive systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes)
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

| Teaching cycle |
| --- |
| -- |

| **Referred to in LPO I** (examination regulations for teaching-degree programmes) |
| --- |
| § 22 II Nr. 3 b) |

| **Module appears in** |
| --- |
| First state examination for the teaching degree Gymnasium Computer Science (2015) |
| Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) |
| Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) |

| Module title | | Abbreviation |
|---|---|---|
| **Computer Science in Media 1** | | 06-MK-MedInf1-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Professorship of Media Informatics | Institute of Human Computer Media |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 6 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

## Contents

The module *Medieninformatik 1* (*Computer Science for Media 1*) provides students with a fundamental knowledge and a practical overview of current digital media types.

## Intended learning outcomes

Students are familiar with the central concepts of media informatics. They have a basic knowledge of information processing with a special focus on digital media.

## Courses (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

## Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 60 minutes) or
b) oral examination (approx. 20 minutes) or
c) term paper (approx. 20 pages) or
d) portfolio (approx. 20 pages)
Language of assessment: German and/or English
creditable for bonus

## Allocation of places

--

## Additional information

--

## Workload

180 h

## Teaching cycle

--

## Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

## Module appears in

Bachelor's degree (1 major) Media Communication (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major, 1 minor) Digital Humanities (2016)
Bachelor's degree (1 major, 1 minor) Digital Humanities (2018)

| Module title | | Abbreviation |
|---|---|---|
| **Computer Science in Media 2** | | 06-MK-MedInf2-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Professorship of Media Informatics | Institute of Human Computer Media |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 6 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

The module *Medieninformatik 2* (*Computer Science for Media 2*) provides deeper knowledge of digital media types and the fundamentals of digital media development and design.

**Intended learning outcomes**

Students have gained a deeper insight into selected concepts of media computer science. In addition, they are able to develop digital media based on various processes. Thus, a basis is provided for academic work as well as for acquiring practically relevant media skills.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + T (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 60 minutes) or
b) oral examination (approx. 20 minutes) or
c) term paper (approx. 20 pages) or
d) portfolio (approx. 20 pages)
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

180 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

Bachelor's degree (1 major) Media Communication (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major, 1 minor) Digital Humanities (2016)
Bachelor's degree (1 major, 1 minor) Digital Humanities (2018)

| Module title | | Abbreviation |
|---|---|---|
| Aerospace Seminar | | 10-I=SA-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

| Contents |
|---|
| Current topics in the area of aerospace. |

| Intended learning outcomes |
|---|
| The students possess a fundamental and applicable knowledge about advanced topics in software engineering with a focus on modern software architectures and fundamental approaches to model-driven software engineering. |

| Courses (type, number of weekly contact hours, language — if other than German) |
|---|
| S (2) |

| Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus) |
|---|
| Seminar paper (approx. 20 pages) |

| Allocation of places |
|---|
| -- |

| Additional information |
|---|
| -- |

| Workload |
|---|
| 150 h |

| Teaching cycle |
|---|
| -- |

| Referred to in LPO I (examination regulations for teaching-degree programmes) |
|---|
| § 22 II Nr. 3 b) |

| Module appears in |
|---|
| Master's degree (1 major) Space Science and Technology (2015)<br>First state examination for the teaching degree Gymnasium Computer Science (2015) |

| Module title | Abbreviation |
|---|---|
| **Exam Tutorial for the German Staatsexamen** | 10-I-REP-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 4 | (not) successfully completed | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 2 semester | undergraduate | -- | |

**Contents**

Revision of contents of modules covering the subject as well as the subject didactics of computer science.

**Intended learning outcomes**

The students have refreshed their skills for the solution of the type of problems asked in the written state examination.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

One exercise per area covered in the state examination

**Allocation of places**

--

**Additional information**

--

**Workload**

120 h

**Teaching cycle**

--

**Referred to in LPO I**  (examination regulations for teaching-degree programmes)

§ 22 II Nr. 2 f)
§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

| Module title | | Abbreviation |
|---|---|---|
| **Deductive Databases** | | 10-I=DDB-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 8 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

Syntax and semantics of logic programs; data structures, program structures and applications for Prolog; analytical methods for Datalog; negation and stratification; disjunctive logic programs.

**Intended learning outcomes**

The students possess expertise in working with Prolog and Datalog (including negation and disjunction).

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

240 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

# Teaching

(10 ECTS credits)

# Compulsory Courses

(10 ECTS credits)

| Module title | | Abbreviation |
|---|---|---|
| **Computer Science Education 1 (incl. Practical Course in the Application of Computer Science Systems form an Educational Point of View)** | | 10-I-DDI1-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 6 | numerical grade | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 2 semester | undergraduate | -- | |

**Contents**

The module gives an overview of computer science didactics. It demonstrates and discusses possibilities for a practical application in the classroom.

**Intended learning outcomes**

Students are familiar (in particular in the area of computer science in *Sekundarstufe I*) with methods, techniques and media for teaching topics in computer science. They are able to didactically analyse and prepare practical topics. Students are familiar with both historical and current teaching approaches, typical teaching methods as well as guidelines and standards for teaching computer science. They are able to plan, organise and deliver classes.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2) + P (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

180 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 49 I Nr. 2
§ 69 I Nr. 2

**Module appears in**

First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Computer Science Education 2** | | | 10-I-DDI2-GY-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | | Only after succ. compl. of module(s) |
|---|---|---|---|
| 4 | numerical grade | | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

This course discusses different topics in computer science didactics in more detail. It demonstrates and discusses possibilities for a practical application in the classroom.

**Intended learning outcomes**

The students are able to plan, execute and assess projects, are familiar with important aspects of the planning and analysis of computer science classes, master fundamental teaching and learning strategies and are able to assess these.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

120 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 69 I Nr. 2 and § 69 I Nr. 1 c): Rechnerarchitektur

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)

# Paper

(4 ECTS credits)

Students studying for a teaching degree Gymnasium must complete a practical training in didactics and teaching methodology (studienbegleitendes fachdidaktisches Praktikum) which refers to one of the subjects they selected as vertieft studiertes Fach (subject studied with a focus on the scientific discipline) pursuant to Section 34 Subsection 1 No. 4 LPO I (examination regulations for teaching-degree programmes). The obligatory accompanying tutorial is offered by the respective subject. The ECTS credits obtained are counted in the subject Erziehungswissenschaften pursuant to Section 10 Subsection 3 LASPO (general academic and examination regulations for teaching-degree programms).

| Module title | | Abbreviation |
|---|---|---|
| **Practical Training in Classroom Teaching in Computer Science Education including Theory (German Gymnasium)** | | 10-I-SBFD-GY-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 4 | (not) successfully completed | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

The module introduces students to the classroom practice of their *Unterrichtsfach* (subject studied with a focus on the scientific discipline). Using specific teaching models, examples and projects in different grades, the module introduces students to subject-specific techniques. In the university course accompanying the placement, students reflect and structure the school type-specific experiences made during their teaching placements and explore additional subject-specific and didactic aspects. In this context, the course discusses selected practical aspects of teaching computer science in accordance with applicable guidelines and curricula. The course focuses on recent developments in classroom practice, also taking into account aspects of school pedagogy and learning psychology that can support the successful practical implementation of subject-specific conceptual designs.

**Intended learning outcomes**

The students are familiar with the most important components of planning and organising classes. They are able to teach the relevant topics in different grades as well as to critically reflect recent developments in education. They are able to connect ideas from school pedagogy and learning psychology with their expertise in the area of didactics and to incorporate these into their teaching.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (0) + S (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Written elaboration of teaching practice (15 to 20 pages)
Contents and duration of placement as specified in Section 34 Subsection 1 Sentence 1 No. 4 LPO I (examination regulations for teaching-degree programmes); participation in mandatory teaching practice, completion of all set tasks as specified by placement school.

**Allocation of places**

--

**Additional information**

--

**Workload**

120 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 34 I 1 Nr. 4

**Module appears in**

First state examination for the teaching degree Gymnasium Educational Science (2015)

# Freier Bereich (general as well as subject-specific electives)

## ( ECTS credits)

Teaching degree students must take modules worth a total of 15 ECTS credits in the area Freier Bereich (general as well as subject-specific electives) (Section 9 LASPO (general academic and examination regulations for teaching-degree programmes)). To achieve the required number of ECTS credits, students may take any modules from the areas below.

Freier Bereich -- interdisciplinary: The interdisciplinary additional offer for a teaching degree can be found in the respective Annex "Ergänzende Bestimmungen für den "Freien Bereich" im Rahmen des Studiums für ein Lehramt".

# Computer Science

( ECTS credits)

(Freier Bereich (general as well as subject-specific electives) -- subject specific)

| Module title | | Abbreviation |
|---|---|---|
| **Tutor activity 1** | | 10-I-TUT1-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 2 | (not) successfully completed | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1-2 semester | undergraduate | -- |

**Contents**

Tutoring activities in the area of computer science.

**Intended learning outcomes**

Imparting knowledge and skills to students of computer science.

**Courses** (type, number of weekly contact hours, language — if other than German)

T (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Wrap-up report on tutoring activities (5 to 10 pages)

**Allocation of places**

--

**Additional information**

--

**Workload**

60 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024)

| Module title | | Abbreviation |
|---|---|---|
| **Tutor activity 2** | | 10-I-TUT2-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 2 | (not) successfully completed | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1-2 semester | undergraduate | -- |

**Contents**

Tutoring activities in the area of computer science.

**Intended learning outcomes**

Imparting knowledge and skills to students of computer science.

**Courses** (type, number of weekly contact hours, language — if other than German)

T (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Wrap-up report on tutoring activities (5 to 10 pages)

**Allocation of places**

--

**Additional information**

--

**Workload**

60 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

**Module appears in**

Bachelor's degree (1 major) Computer Science (2015)
First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)
Bachelor's degree (1 major) Computer Science (2017)
Bachelor's degree (1 major) Computer Science (2019)
Bachelor's degree (1 major) Computer Science und Sustainability (2021)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023)
Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024)

| Module title | | Abbreviation |
|---|---|---|
| **Seminar Computer Science Education** | | 10-I-DS-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 4 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Selected topics in computer science didactics.

**Intended learning outcomes**

The students gain initial experience in the area of independent scientific work. They are able to acquaint themselves with and structure a given topic, using selected literature, as well as to prepare a talk on the respective subject. They are also able to actively participate in a scientific discussion.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written elaboration (approx. 20 pages) and presentation including discussion (approx. 45 to 60 minutes) on a topic from the field of computer science didactics
Assessment offered: Only in the semester in which the course is offered

**Allocation of places**

--

**Additional information**

--

**Workload**

120 h

**Teaching cycle**

Teaching cycle: usually once a year

**Referred to in LPO I**  (examination regulations for teaching-degree programmes)

§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

**Module appears in**

First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Advanced Topics of Computer Science Education** | | 10-I-DV-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 4 | (not) successfully completed | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Discussion of topics in teaching computer science in *Gymnasium* that takes into account different aspects, in particular subject-specific foundations, didactic analyses, the contemporary debate in computer science didactics as well as possible approaches in the classroom.

**Intended learning outcomes**

The students are able to discuss central topics and issues on teaching computer science in a *Gymnasium*, taking into account subject-specific, didactic and methodical aspects.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

talk (approx. 30 minutes) or practical assignment (exercise) with examination talk (approx. 15 minutes)
Assessment offered: Only in the semester in which the course is offered

**Allocation of places**

--

**Additional information**

--

**Workload**

120 h

**Teaching cycle**

Teaching cycle: Usually every 2 years

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 2 f)
§ 22 II Nr. 2 f), § 22 II Nr. 3 f)

**Module appears in**

First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Robotics in Education (practical course)** | | 10-I-DRO-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 4 | (not) successfully completed | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1 semester | undergraduate | -- | |

| Contents |
|---|
| Discussion of problems in robotics in the computer science classroom that takes into account different aspects, in particular subject-specific foundations, didactic analyses, the contemporary debate in computer science didactics as well as possible approaches in the classroom. |

| Intended learning outcomes |
|---|
| The students are able to discuss central topics and questions of robotics in the computer science classroom, taking into account subject-specific, didactic and methodical aspects. |

| Courses (type, number of weekly contact hours, language — if other than German) |
|---|
| Ü (2) |

| Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus) |
|---|
| practical assignment (supervision of a group of pupils) with examination talk (approx. 15 minutes) Assessment offered: Only in the semester in which the course is offered |

| Allocation of places |
|---|
| -- |

| Additional information |
|---|
| -- |

| Workload |
|---|
| 120 h |

| Teaching cycle |
|---|
| Teaching cycle: Usually every 2 years |

| Referred to in LPO I (examination regulations for teaching-degree programmes) |
|---|
| § 22 II Nr. 2 f) <br> § 22 II Nr. 3 f) |

| Module appears in |
|---|
| First state examination for the teaching degree Realschule Computer Science (2015) <br> First state examination for the teaching degree Gymnasium Computer Science (2015) |

| Module title | | Abbreviation |
|---|---|---|
| **Practical Course on Computer Science Education** | | 10-I-DPR-152-m01 |

| Module coordinator | | Module offered by |
|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 4 | (not) successfully completed | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | undergraduate | -- |

**Contents**

Discussion of problems in programming in the computer science classroom that takes into account different aspects, in particular subject-specific foundations, didactic analyses, the contemporary debate in computer science didactics as well as possible approaches in the classroom.

**Intended learning outcomes**

The students are able to discuss central topics and questions of programming in the computer science classroom, taking into account subject-specific, didactic and methodical aspects.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

practical assignment with examination talk (approx. 15 minutes)
Assessment offered: Only in the semester in which the course is offered

**Allocation of places**

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**Additional information**

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**Workload**

120 h

**Teaching cycle**

Teaching cycle: Usually every 2 years

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

**Module appears in**

First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)

| Module title | | Abbreviation |
|---|---|---|
| **Hands-on Computer Science** | | 10-I-DPP-152-m01 |

| Module coordinator | Module offered by |
|---|---|
| Dean of Studies Informatik (Computer Science) | Institute of Computer Science |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 6 | (not) successfully completed | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 2 semester | undergraduate | -- |

**Contents**

Design and implementation of a school project on a topic in computer science, e. g. for project days, school term papers (*Facharbeiten*), *Pluskurse* (additional courses for the in-depth study of areas of special interest), workshops. In the theoretical phase, the students formulate the subject-specific and didactic requirements of the topic, search for a suitable topic, elaborate this topic for the project and draw up a project plan. This is done in groups with students providing each other with advice as well as challenging and reflecting on each other's work. In the practical phase, the students prepare the implementation of the project, implement the project with pupils and afterwards reflect the planning and implementation.

**Intended learning outcomes**

The students are able to select a topic from the area of computer science that is suitable for a school project and are able to elaborate it. They are familiar with different aspects of project planning and management and are able to critically reflect the process.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (2) + S (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

practical assignment (preparing and delivering a school lab session) with examination talk (approx. 15 minutes)
Assessment offered: Only in the semester in which the course is offered

**Allocation of places**

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**Additional information**

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**Workload**

180 h

**Teaching cycle**

Teaching cycle: Usually every 2 years

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

**Module appears in**

First state examination for the teaching degree Realschule Computer Science (2015)
First state examination for the teaching degree Gymnasium Computer Science (2015)

# Paper

(10 ECTS credits)

Preparation of a written Hausarbeit (thesis) in accordance with the provisions of Section 29 LPO I (examination regulations for teaching-degree programmes) is a prerequisite for teaching degree students to be admitted to the Erste Staatsprüfung (First State Examination). In accordance with the provisions of Section 29 LPO I, students studying for a teaching degree Gymnasium may write this thesis in one of the subjects they selected as vertieft studiertes Fach (subject studied with a focus on the scientific discipline) or in the subject Erziehungswissenschaften (Educational Science). Pursuant to Section 29 Subsection 1 Sentence 2 LPO I, students may also choose to write an interdisciplinary thesis.

| Module title | | | Abbreviation |
|---|---|---|---|
| **Thesis Computer Science (Teaching Degree at the German Gymnasium)** | | | 10-I-HA-GY-152-m01 |

| Module coordinator | | Module offered by | |
|---|---|---|---|
| Dean of Studies Informatik (Computer Science) | | Institute of Computer Science | |

| ECTS | Method of grading | Only after succ. compl. of module(s) | |
|---|---|---|---|
| 10 | numerical grade | -- | |

| Duration | Module level | Other prerequisites | |
|---|---|---|---|
| 1-2 semester | undergraduate | -- | |

**Contents**

Researching and writing on a defined problem in computer science or computer science didactics within a given time frame and adhering to the principles of good scientific practice.

**Intended learning outcomes**

The students are able to research and write on a defined problem, adhering to the principles of good scientific practice.

**Courses** (type, number of weekly contact hours, language — if other than German)

No courses assigned to module

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Hausarbeit (thesis) pursuant to Section 29 LPO I (examination regulations for teaching-degree programmes) (250 to 300 hours)
Language of assessment: German; exceptions pursuant to Section 29 Subsection 4 LPO I (examination regulations for teaching-degree programmes)

**Allocation of places**

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**Additional information**

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**Workload**

300 h

**Teaching cycle**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 29

**Module appears in**

First state examination for the teaching degree Gymnasium Computer Science (2015)