UNIVERSITÄT ZU LÜBECK

Module Guide for the Study Path

Master Artificial Intelligence 2023

Version from 4. April 2024

1st or 2nd semester

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1st semester at the earliest

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CS4337-KP12 - Bio-Inspired Computing (BioInCo)

Duration:	Turnus of offer:	Credit points:
1 Semester	every summer semester	12

Course of study, specific field and term:

- Master Artificial Intelligence 2023 (compulsory), Artificial Intelligence, 1st or 2nd semester

Classes and lectures:

- Evolutionary Robotics (lecture, 2 SWS)
- Collective Robotics (lecture, 2 SWS)
- Foundations of Machine Learning and Data Science (lecture, 2 SWS)
- Machine Learning Lab (practical course, 2 SWS)

Workload:

- 240 Hours private studies
- 90 Hours e-learning
- 30 Hours work on project

Contents of teaching:

- Foundations of Machine Learning and Data Science: Classification, regression, prediction: perceptrons, multi-layer perceptrons, and deep learning / Statistical principles: sampling, estimators, distribution, density, cumulative distribution, scales: nominal, ordinal, interval, and ratio scales, hypothesis testing, confidence intervals / Stochastic foundations, probabilities, Bayesian networks for the specification of discrete distributions, queries, query answering algorithms, learning procedures for Bayesian networks / Time series analysis: autoregression, integration, moving average (ARIMA), ordinal patterns, permutation entropy features, dynamic Bayesian networks and associated machine learning techniques / Inductive learning: version space, information theory, decision trees, rule learning / Ensemble methods, bagging, boosting, random forests / Automated machine learning / Clustering, k-means, analysis of variation (ANOVA), T-test, inter-cluster variation, intra-cluster variation, F-statistics, Bonferroni correction, MANOVA.
- Evolutionary Robotics: Biological basics of natural evolution / Evolutionary computation and optimization: coding, search spaces, genetic operators / Conducting evolutionary experiments with mobile robots in hardware and in simulation / Robot simulations and the reality gap / Concepts of reactive behavior and how to go beyond / Explanation of evolutionary dynamics in terms of nonlinear dynamics / Heuristic and empirical approach in robot experiments / Modular robotics for evolution of robot morphologies / Intensive discussion of state of the art methods, such as bridging the reality gap, novelty search, MAP elites, etc.
- Collective Robotics: Self-organization and feedback loops in systems / Basics of swarm behaviors, swarm robotics and behavior-based robotics / Robot swarms on land, water and in the air / Self-organized coordination of robots, autonomous assignment of tasks and roles, online distribution of tasks / Collective behaviors limited by local information, representative samples / Synchronization, estimate group size, mathematical modeling, micro-macro problem, random graphs / Collective decision making, urn models, opinion dynamics, speed vs accuracy tradeoff / Bio-hybrid robotics: animals and robots, plants and robots, cyborgs
- Machine Learning Lab: Methods and algorithms for the visualization, analysis and generation of medical image data, including current research work in the field of medical image processing / Basics of medical image processing visualization and pre-processing of images / Image data augmentation techniques / Basics of connectionist networks in medical image processing / Convolutional networks and deep learning in medical image processing / U-Nets and generative adversarial networks (GANs) for the generation of medical image data / Generative models for medical image processing

Qualification-goals/Competencies:

- For all topics listed in the course content under the bullet points, students will be able to name the central ideas, define the relevant terms in each case, and explain how associated algorithms work using examples of applications.

Grading through:

- portfolio exam

Responsible for this module:

- Prof. Dr.-Ing. Mladen Berekovic

Teacher:

- Institute of Medical Informatics
- Institute of Computer Engineering
- Institute of Software Technology and Programming Languages

- Dr. rer. nat. Javad Ghofrani
- Dr. Gesina Schwalbe
- Prof. Dr. rer. nat. habil. Heinz Handels

Literature:

- S. Nolfi, D. Floreano: Evolutionary Robotics - MIT Press, 2001
- H. Hamann: Swarm Robotics: A Formal Approach - Springer, 2018
- M.P. Deisenroth, A.A. Faisal, C.S. Ong: Mathematic of Machine Learning - Cambridge University Press, 2020
- S.J. Russell, P. Norvig: Artificial Intelligence: A Modern Approach - 4th Ed., Pearson, 2020
- M. Kaptein, E. van den Heuvel: Statistics for Data Scientists: An Introduction to Probability, Statistics, and Data Analysis - Springer, 2022

Language:

- offered only in English

Notes:

Prerequisites for attending the module:
- None

Prerequisites for the exam:
- 50% of online quiz points

Module exam(s):
CS4337-L1:Bio-Inspired Computing portfolio exam for a total of 100 points, divided as follows:
- 50 points for an e-test (oral or written).
- 50 points for a project presentation

CS4171-KP12 - Next Generation AI Technology (NGAI)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	12

Course of study, specific field and term:

- Master Artificial Intelligence 2023 (compulsory), Artificial Intelligence, 1st semester at the earliest

Classes and lectures:

- Quantum Computing (lecture, 2 SWS)
- Quantum Computing (practical course, 2 SWS)
- Parallel Computing Systems (lecture, 2 SWS)
- Parallel Computing Lab (practical course, 2 SWS)

Workload:

- 240 Hours private studies
- 60 Hours e-learning
- 60 Hours work on project

Contents of teaching:

- Quantum Computing: Introduction to Quantum Computing / The Bloch Sphere / Quantum Logic Gates / Qiskit and Deutsch-Jozsa Algorithm / Silq / Grover's Search / Quantum Annealing Versus Grover's Search: Optimizing Transaction Schedules / Quantum Data Encoding Patterns / Introduction into Quantum Machine Learning: Data Encoding, Model, Measurement / Quantum Machine Learning: Optimization / Quantum Cryptography: Shor, Quantum Key Distribution / Quantum Error Correction
- Parallel Computing Systems: Motivation and limits for parallel processing / Models of parallel processing / Classification of parallel computers / multi/manycore systems / Graphics processing units (GPUs) / OpenCL / Tensor Processing / Programming environments for parallel computers / Hardware architectures / System management of manycore systems

Qualification-goals/Competencies:

- For all topics listed in the course content under the bullet points, students will be able to name the central ideas, define the relevant terms in each case, and explain how associated algorithms work using examples of applications.

Grading through:

- portfolio exam

Responsible for this module:

- Prof. Dr.-Ing. Mladen Berekovic

Teacher:

- Institute of Information Systems
- Institute of Computer Engineering

- Prof. Dr.-Ing. Mladen Berekovic
- Dr. rer. nat. Javad Ghofrani
- Prof. Dr. Sven Groppe

Literature:

- M. McCool, J. Reinders, A.D. Robison: Structured Parallel Programming - Morgan Businessman, 2012
- T. Rauber, G. Rünger: Parallel Programming - Springer Publishers, 2012
- D.A. Patterson, J.L. Hennessy: Computer Organization and Design: The Hardware/Software Interface - Morgan Businessman, 2013
- D. Kaeli, P. Mistry, D. Schaa, D.P. Zhang: Heterogeneous Computing with OpenCL 2.0 - Morgan Businessman, 2015
- M.A. Nielsen, I.L. Chuang: Quantum Computation and Quantum Information - Cambridge University Press, 2010
- S. Ganguly, T. Cambier: Quantum Computing with Silq Programming - Packt Publishing, 2021
- M. Homeister: Quantum Computing verstehen: Grundlagen Anwendungen Perspektiven - Springer, 2022

Language:

- offered only in English

Notes:

Prerequisites for attending the module:
- None

Prerequisites for the exam:
- 50% of online quiz points, successful seminar presentation

Module exam(s):
CS4171-L1: Next-Generation AI Technology portfolio exam for a total of 100 points, divided as follows:
- 50 points for an e-test (oral or written).
- 50 points for a project presentation

CS5071-KP12 - Next Generation AI Computing and Learning (AIComLea)

Duration:	Turnus of offer:	Credit points:
2 Semester	starts every summer semester	12

Course of study, specific field and term:

- Master Artificial Intelligence 2023 (compulsory), Artificial Intelligence, 1st semester at the earliest

Classes and lectures:

- Differential Probabilistic Programming (lecture, 2 SWS)
- Real-Time-Systems (lecture, 2 SWS)
- Real-Time-Systems (practical course, 2 SWS)
- Stochastic Relational Modeling and Learning (lecture, 2 SWS)

Workload:

- 240 Hours private studies
- 90 Hours e-learning
- 30 Hours work on project

Contents of teaching:

- Real-Time Systems: Real-time processing basics (Programmable Logic Controllers, Parallel processes) / Hardware platforms / Process interfaces / Real-time communication systems / Real-time programming / Process monitoring / Process control by using parallel state charts / Control systems design using Laplace transform / Real-time operating systems / Real-time middleware / Fault-tolerant real-time systems
- Differential Probabilistic Programming: Introduction / Gradient descent / Deep networks and Deep learning / Autograd / Probabilistic Programming / Probabilistic Circuits (Grammar, Structural Constraints, Learning, Representation and Theory)
- Stochastic Relational Modeling and Learning: Recap: Propositional modelling / Probabilistic Relational Models / Lifted inference (Lifted variable elimination, Lifted junction tree algorithm) / First-order knowledge compilation / Beyond standard query answering / Lifted learning / Approximate inference: Sampling / Sequential modelling and inference / Decision making

Qualification-goals/Competencies:

- For all topics listed in the course content under the bullet points, students will be able to name the central ideas, define the relevant terms in each case, and explain how associated algorithms work using examples of applications.

Grading through:

- portfolio exam

Responsible for this module:

- PD Dr. Özgür Özçep

Teacher:

- Institute of Computer Engineering
- Institute of Information Systems

- Prof. Dr. rer. nat. habil. Ralf Möller
- PD Dr. Özgür Özçep
- Prof. Dr.-Ing. Mladen Berekovic
- Dr. rer. nat. Javad Ghofrani

Literature:

- D. Koller, N. Friedman: Probabilistic Graphical Models - MIT Press, 2009
- A. Katok, B. Hasselblatt: Introduction to the Modern Theory of Dynamical Systems - Cambridge: Cambridge University Press, 1995
- G. Bolton: Programmable Logic Controllers - Newnes, 2009
- I. Goodfellow, Y. Bengio, and A. Courville: Deep Learning - MIT Press, 2016
- L. D. Raedt, K. Kersting, and S. Natarajan: Statistical Relational Artificial Intelligence: Logic, Probability, and Computation - Morgan & Claypool Publishers, 2016
- B.J. Lurie, P. Enright: Classical Feedback Control with Nonlinear Multi-Loop Systems: With MATLAB® and Simulink® - 2019
- E.N. Sanchez: Discrete-Time Recurrent Neural Control: Analysis and Applications - CRC Press, 2019
- G. Barthe, J.-P. Katoen, A. Silva (Eds.): Foundations of Probabilistic Programming - Cambridge University Press, 2020
- G. Van den Broeck, K. Kersting, S. Natarajan, D. Poole: An Introduction to Lifted Probabilistic Inference - MIT Press, 2021

Language:

- offered only in English

Notes:

Prerequisites for attending the module:
- None

Prerequisites for the exam:
- 50% of online quiz points

Module exam(s):
CS5071-L1: Next Generation AI Computing and Learning portfolio exam for a total of 100 points, divided as follows:
- 50 points for an e-test (oral or written).
- 50 points for a project presentation

CS4519-KP12 - Intelligent Cooperative Agents (IntCoAgent)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	12

Course of study, specific field and term:

- Master Artificial Intelligence 2023 (compulsory), Artificial Intelligence, 2nd or 3rd semester

Classes and lectures:

- Intelligent Cooperative Agents (practical course, 2 SWS)
- Intelligent Cooperative Agents (lecture, 6 SWS)

Workload:

- 240 Hours private studies
- 90 Hours e-learning
- 30 Hours work on project

Contents of teaching:

- Agents, Mechanisms, and Collaboration: Intelligent agents and artificial intelligence / Game theory and social choice / Mechanism design, algorithmic mechanism design / Agent collaboration, rules of encounter / Continuous Space / Epistemic logic / Knowledge and seeing / Knowledge and time / Dynamic epistemic logic / Knowledge-based programs
- Perception (Language and Vision): Information retrieval and web-mining agents / Probabilistic dimension reduction, latent content descriptions, topic models, LDA, LDA-HMM / Representation learning for sequential structures, embedding spaces, word2vec, CBOW, skip-gram, hierarchical softmax, negative sampling / Language models (1d-CNNs. RNNs, LSTMs, ELMo, Transformers, BERT, GPT-3/OPT, and beyond), Natural language inference and query answering / Computer Vision (2D-CNNs, Deep Architectures: AlexNet, ResNet) / Combining language and vision (CLIP (OpenAI) / LIT (Google) / data2vec (Facebook) / Flamingo (DeepMind), DALL-E and beyond) / Knowledge graph embedding with GNNs, combining embedding-based KG completion with probabilistic graphical models (ExpressGNN, pLogicNet), MLN inference and learning based on embedded knowledge graphs, GMNNs)
- Planning, Causality, and Reinforcement Learning: Planning and acting with deterministic models, temporal models, nondeterministic models, probabilistic models / Standard decision making / Advanced decision making and reinforcement learning / Causal dependencies / Intervention / Instrumental variables / Counterfactuals / Causal planning / Causal reinforcement learning

Qualification-goals/Competencies:

- For all topics listed in the course content under the bullet points, students will be able to name the central ideas, define the relevant terms in each case, and explain how associated algorithms work using examples of applications.

Grading through:

- portfolio exam

Requires:

- Bio-Inspired Computing (CS4337-KP12)

Responsible for this module:

- Prof. Dr.-Ing. Nele Rußwinkel

Teacher:

- Institute of Information Systems
- Prof. Dr.-Ing. Nele Rußwinkel

Literature:

- M Ghallab, D. Nau, P. Traverso: Automated Planning and Acting - Cambridge University Press, 2016
- J. Pearl, C. Glymour, and N.P. Jewell: Causal Inference in Statistics--A Primer - Wiley, 2016
- S.J. Russell, P. Norvig, Artificial Intelligence: A Modern Approach - 4th Ed., Pearson, 2020
- Y. Shoham, K. Leyton-Brown: Multiagent-Systems: Algorithmic, Game-Theoretic, and Logical Foundations - Cambridge University Press, 2009

Language:

- offered only in English

Notes:

Prerequisites for attending the module:
- None (The competencies of the modules listed under 'Requires' are needed for this module, but are not a formal prerequisite)

Prerequisites for the exam:
- 50% of online quiz points

Module exam(s):
CS4514-L1: Intelligent Cooperative Agents portfolio exam for a total of 100 points, divided as follows:
- 50 points for an e-test (oral or written).
- 50 points for a project presentation

CS5076-KP12 - Human-Centered Trustworthy AI (HumTrustAI)

Duration:	Turnus of offer:	Credit points:
1 Semester	every summer semester	12

Course of study, specific field and term:

- Master Artificial Intelligence 2023 (compulsory), Artificial Intelligence, 3rd and 4th semester

Classes and lectures:

- Cognition and Human-aware Interaction (lecture, 3 SWS)
- Trustworthy AI (lecture, 3 SWS)
- TCHAI Lab (practical course, 2 SWS)

Workload:

- 240 Hours private studies
- 90 Hours e-learning
- 30 Hours work on project

Contents of teaching:

- Human-Centered AI: Cognitive Modeling / Behavior Modeling / User and Group Modeling / Personalization / Cognitive Architectures / Human-aware Planning / Provably Beneficial AI / Ethics for AI Systems
- Trustworthy AI: Guiding principles of Trustworthy AI: lawful, ethical and robust AI l Trustworthy Computing Basics: Security, Privacy, Dependability, Safety, Transparency, Explainability, Traceability, Accountability / De-anonymization methods using machine learning models / Mathematical notions for privacy-preserving machine learning methods / Privacy-preserving machine learning methods / Analysis of machine learned models (robustness check, explainability / Verification of machine learned models (statistical Testing, model checking) / Black-Box methods for extracting machine learning models (for economic reasons, for analysis, and for verification) / Attacks for manipulating machine learning models (adversarial examples, backdoors) Hardening of machine learning methods against manipulation methods / Robust machine learning methods against manipulation attacks / Secure and privacy-preserving distributed learning methods (privacy-preserving federated learning)

Qualification-goals/Competencies:

- For all topics listed in the course content under the bullet points, students will be able to name the central ideas, define the relevant terms in each case, and explain how associated algorithms work using examples of applications.

Grading through:

- portfolio exam

Requires:

- Intelligent Cooperative Agents (CS4519-KP12)

Responsible for this module:

- Prof. Dr. Esfandiar Mohammadi

Teacher:

- Institute of Software Technology and Programming Languages
- Institute of Information Systems

- Prof. Dr. Martin Leucker
- Prof. Dr. Thomas Eisenbarth
- Prof. Dr. Esfandiar Mohammadi
- Prof. Dr.-Ing. Nele Rußwinkel

Literature:

- N. Li, M. Lyu, D. Su, W. Yang: Differential Privacy: From Theory to Practice - Morgan Claypool, 2016
- S. Farrel, S. Lewandowsky: Computational Modeling of Cognition and Behavior - Cambridge University Press, 2018
- G. Marcus, E. Davis: Rebooting AI: Building Artificial Intelligence We Can Trust - Pantheon Books, 2019
- S.J. Russell: Human Compatible: Artificial Intelligence and the Problem of Control - Penguin Books, 2020
- M.H. ur Rehman, M.M. Gaber: Federated Learning Systems: Towards Next-Generation AI - Springer, 2021
- C.S. Nam, J.-Y. Jung, S. Lee (Eds.): Human-Centered Artificial Intelligence: Research and Applications - Elsevier, 2022
- B. Ammanath: Trustworthy AI: A Business Guide for Navigating Trust and Ethics in AI - Wiley, 2022

Language:

- offered only in English

Notes:

Prerequisites for attending the module:
- None (The competencies of the modules listed under 'Requires' are needed for this module, but are not a formal prerequisite)

Prerequisites for the exam:
- 50% of online quiz points

Module exam(s):
CS5076-L1: Human-Centered Trustworthy AI portfolio exam for a total of 100 points, divided as follows:
- 50 points for an e-test (oral or written).
- 50 points for a project presentation

CS5995-KP30 - Master Thesis Artificial Intelligence (MasterAI)

Duration:	Turnus of offer:	Credit points:
1 Semester	each year, can be started in winter or summer semester	30

Course of study, specific field and term:

- Master Artificial Intelligence 2023 (compulsory), Artificial Intelligence, 4th semester at the earliest

Classes and lectures:

- Master's Thesis (supervised self studies, 1 SWS)
- Colloquium (colloquium, 1 SWS)

Workload:

- 870 Hours research for and write up of a thesis
- 30 Hours oral presentation and discussion (including preparation)

Contents of teaching:

- Individual studies under supervision

Qualification-goals/Competencies:

- The students are able to structure a comprehensive and complex problem from the field of artificial intelligence or its applications and to solve it within limited time.
- They are able to get acquainted with a problem int he field of AI in a detailed way, to analyse corresponding literature, to work out a solution and to document the solution in a written thesis.
- They can evaluate their solution critically and present it in a talk and defend it in a scientific discussion.

Grading through:

- Written report
- colloquium

Teacher:

- Institutes of the Department of Computer Science/ Engineering
- Alle prüfungsberechtigten Dozentinnen/Dozenten des Studienganges

Language:

- offered only in English

Notes:

Admission requirements for taking the module:
- See study program regulations (e.g. certain minimum CP achieved).

Admission requirements for participation in module examination(s):
- CS5995-L2: see examination regulations (e.g. master's thesis assessed with at least sufficient).

Module exam(s):
- CS5995-L1: Master thesis, approx. 67% of the module grade.
- CS5995-L2: Colloquium, ca 33% of the module grade

CS4212-KP04, CS4212 - Current Topics SSE (SSEaktuell)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4

Course of study, specific field and term:

- Master Computer Science 2019 (optional subject), Elective, Arbitrary semester
- Master Computer Science 2019 (compulsory), Canonical Specialization SSE, Arbitrary semester
- Master Computer Science 2014 (compulsory), specialization field software systems engineering, 2nd or 3rd semester
- Master Artificial Intelligence 2023 (optional subject), for equivalence check, Arbitrary semester

Classes and lectures:

- Current Topics SSE (lecture, 2 SWS)
- Current Topics SSE (seminar, 1 SWS)

Workload:

- 60 Hours private studies and exercises
- 45 Hours in-classroom work
- 15 Hours exam preparation

Contents of teaching:

- Model based development
- Quality assurance
- Development of web and mobile applications

Qualification-goals/Competencies:

- The students can apply modern software engineering technologies in practice.
- They can classify and evaluate current trends in software systems engineering.

Grading through:

- Written or oral exam as announced by the examiner

Responsible for this module:

- Prof. Dr. Martin Leucker

Teacher:

- Institute of Software Technology and Programming Languages
- Prof. Dr. Martin Leucker

Literature:

- Aktuelle Forschungsartikel werden in der Veranstaltung bekanntgegeben.:

Language:

- German and English skills required

Notes:

Prerequisites for attending the module:
- None

Prerequisites for the exam:
- Successful completion of homework assignments during the semester

CS4520-KP12, CS4520 - Case study in professional product development (Fallstudie)

Duration:	Turnus of offer:	Credit points:	Max. group size:
2 Semester	each semester	12	12

Course of study, specific field and term:

- Master Entrepreneurship in Digital Technologies 2020 (advanced module), technology field computer science, Arbitrary semester
- Master Computer Science 2019 (optional subject), advanced module, Arbitrary semester
- Master Entrepreneurship in Digital Technologies 2014 (advanced module), technology field computer science, 2nd and 3rd semester
- Master Computer Science 2014 (advanced module), advanced curriculum, 2nd and 3rd semester
- Master Artificial Intelligence 2023 (optional subject), for equivalence check, Arbitrary semester

Classes and lectures:

- Basics for product development (exercise, 2 SWS)
- Product development (practical course, 6 SWS)

Workload:

- 120 Hours group work
- 120 Hours in-classroom work
- 70 Hours private studies
- 30 Hours oral presentation (including preparation)
- 20 Hours exam preparation

Contents of teaching:

- generating ideas for product development
- developing a business plan
- planning and developing a prototype
- techniques for management and planning
- product cycles
- economic studies
- licences

Qualification-goals/Competencies:

- Students can start working in or leading a team for product development in informatics.
- They can organize and conduct the different phases of product development.
- They can assess legal and economic restrictions of product development.
- They are able to play different roles in a developing team.

Grading through:

- Oral examination

Responsible for this module:

- Studiengangsleitung Informatik

Teacher:

- Institutes of the Department of Computer Science/ Engineering
- Alle prüfungsberechtigten Dozentinnen/Dozenten des Studienganges

Language:

- English, except in case of only German-speaking participants

Notes:

Basics for product development can be taught by various appropriate forms of instruction other than exercises.

Prerequisites for attending the module:
- None

Prerequisites for the exam:
- continuous, successful participation in course
- presentation
- successful addressing of the project goals
- documentation
- grading by the reviewer

CS5490-KP06, CS5490SJ14 - Lab Software Systems Engineering (PrSSE14)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	6 (Typ B)

Course of study, specific field and term:

- Master Artificial Intelligence 2023 (optional subject), for equivalence check, Arbitrary semester
- Master Computer Science 2019 (compulsory), Canonical Specialization SSE, Arbitrary semester
- Master Computer Science 2019 (optional subject), Elective, Arbitrary semester
- Master Computer Science 2014 (compulsory), specialization field software systems engineering, 2nd or 3rd semester

Classes and lectures:

- Lab Software Systems Engineering (programming project, 4 SWS)

Workload:

- 60 Hours group work
- 60 Hours in-classroom work
- 40 Hours private studies
- 20 Hours oral presentation and discussion (including preparation)

Contents of teaching:

- Design and implementation of an advanced component-based software/hardware system in team work

Qualification-goals/Competencies:

- The students can realize complex software/hardware systems with the acquired techniques.
- They can derive a system design from a requirements specification.
- They can construct a component-based architecture meeting the system design.
- They can implement, test, and integrate components.
- They can document, present, evaluate and improve the implemented system.
- They can cooperate within a teamfor a successful project.

Grading through:

- continuous, successful participation in practical course

Responsible for this module:

- Prof. Dr. Martin Leucker

Teacher:

- Institute for Theoretical Computer Science
- Institute of Information Systems
- Institute of Telematics
- Institute of Software Technology and Programming Languages

- Prof. Dr. Martin Leucker
- Prof. Dr. rer. nat. habil. Ralf Möller
- Prof. Dr. Stefan Fischer

Literature:

- : Projektspezifische Literatur wird in der Veranstaltung angegeben

Language:

- English, except in case of only German-speaking participants

Notes:

Prerequisites for attending the module:
- None

Prerequisites for the exam:
- Successful participation in the internship (including successful solution of the project tasks) with presentation and documentation as specified at the beginning of the semester

Module exam(s):
CS5490-L1: Project Internship Software Systems Engineering, ungraded internship, 0% of module grade, must be passed.

CS5840-KP04, CS5840 - Seminar in English (SemiEngl)

Duration:	Turnus of offer:	Credit points:
1 Semester	each semester	4 (Typ B)

Course of study, specific field and term:

- Master Artificial Intelligence 2023 (optional subject), for equivalence check, Arbitrary semester
- Master Computer Science 2019 (optional subject), interdisciplinary competence, Arbitrary semester
- Master Computer Science 2014 (optional subject), interdisciplinary competence, Arbitrary semester
- Master Computer Science 2012 (optional suject), interdisciplinary competence, Arbitrary semester

Classes and lectures:

- Seminar in Englisch (seminar, 2 SWS)

Workload:

- 90 Hours work on an individual topic with written and oral presentation
- 30 Hours in-classroom work

Contents of teaching:

- Familiarization in a demanding scientific topic
- Working on a scientific topic and its answers for problems on their own
- Presentation and discussion of the topic in English

Qualification-goals/Competencies:

- The students can obtain a solid grounding a demanding scientific topic.
- They can review a scientific work.
- They are able to present the results in a written documentation and in a talk in an understandable way.
- The can present and discuss a scientific topic in English.
- They can follow a scientific presentation and assess critically in an open discussion.

Grading through:

- oral presentation
- Written report

Responsible for this module:

- Studiengangsleitung Informatik

Teacher:

- Institutes of the Department of Computer Science/ Engineering
- Alle prüfungsberechtigten Dozentinnen/Dozenten des Studienganges

Literature:

- is selected individually:

Language:

- offered only in English

Notes:

Prerequisites for attending the module:
- None

Prerequisites for the exam:
- Successful participation in the seminar incl. elaboration, presentation, contributions to the discussion according to the requirements at the beginning of the semester.

Module exam(s):
CS5840-L1: English Language Seminar, Seminar, 100% of (non-existent) module grade.

Registration and topic assignment in a preliminary meeting at the end of the preceding semester.

PS4670-KP04 - Studium Generale (StuGen)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4 (Typ B)

Course of study, specific field and term:

- Master Artificial Intelligence 2023 (optional subject), for equivalence check, Arbitrary semester
- Bachelor Interdisciplinary Courses for health sciences (optional subject), interdisciplinary competence, Arbitrary semester
- Master Interdisciplinary Courses (optional subject), Interdisciplinary modules, Arbitrary semester
- Bachelor Interdisciplinary Courses (optional subject), Interdisciplinary modules, Arbitrary semester

Classes and lectures:

- Studium Generale (, 1 SWS)
- Studium Generale (seminar, 1 SWS)

Workload:

- 60 Hours private studies
- 30 Hours work on an individual topic with written and oral presentation
- 30 Hours in-classroom work

Contents of teaching:

- Current social and political topics
- Philosophical, cultural studies and contemporary history perspectives
- Current discussions from science, politics and society
- Text reading and discussions about specialized scientific texts

Qualification-goals/Competencies:

- Students can see through argumentation structures
- They can increase their analysis, reflection and argumentation skills
- Expand knowledge of social and political issues and their current debates.
- Development of a cultural, philosophical, and contemporary historical understanding of the contexts of medicine, the natural sciences, the life sciences, technology, computer science, the health sciences, and psychology.

Grading through:

- continuous, successful participation in course

Responsible for this module:

- Prof. Dr. phil Christina Schües

Teacher:

- Institute for History of Medicine and Science Studies

- Prof. Dr. phil Christina Schües
- Prof. Dr. med. Cornelius Borck
- Prof. Dr. phil. Christoph Rehmann-Sutter
- Dr. phil. Birgit Stammberger
- externe Referent*innen

Literature:

- :

Language:

- offered only in German

Notes:

Prerequisites for attending the module:
- None

Prerequisites for the exam:
- Active participation in the seminar
- Written elaboration according to the requirements at the beginning of the semester

Module exam(s):
- PS4670-L1: Studium Generale, ungraded seminar, 0% of module grade, must be passed.