

## Module Handbook (<https://modhb.uni-kl.de/>)

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### Notes on the module handbook of the department Social Sciences

Die hier dargestellten Studiengang-, Modul- und Kursdaten des Fachbereichs Sozialwissenschaften [SO] befinden sich noch in Entwicklung und sind nicht offiziell.

Die offiziellen Modulhandbücher finden Sie unter <https://www.sowi.uni-kl.de/studium/> (<https://www.sowi.uni-kl.de/studium/>)

## Module SO-02-2151-M-6

Wissensmanagement und Technik (M, 18.0 LP)

### Module Identification

Module Number	Module Name	CP (Effort)
SO-02-2151-M-6	<i>Wissensmanagement und Technik</i>	18.0 CP (540 h)

### Basedata

CP, Effort	18.0 CP = 540 h
Position of the semester	2 Sem. from WiSe/SuSe
Level	[6] Master (General)
Language	[DE/EN] German or English as required
Module Manager	Heyck, Matthias, Dr. (WMA   DEPT: SO) (/staff/419/)
Lecturers	Dengel, Andreas, Prof. Dr. (PROF   DEPT: INF) (/staff/515/) Deßloch, Stefan, Prof. Dr. (PROF   DEPT: INF) (/staff/504/) Ebert, Achim, apl. Prof. Dr. (PROF   DEPT: INF) (/staff/498/) Hinze, Ralf, Prof. Dr. (PROF   DEPT: INF) (/staff/1/) Kloft, Marius, Prof. Dr. (PROF   DEPT: INF) (/staff/518/) Leitte, Heike, Prof. Dr. (PROF   DEPT: INF) (/staff/514/) Liggesmeyer, Peter, Prof. Dr. (PROF   DEPT: INF) (/staff/516/) Lukowicz, Paul, Prof. Dr. (PROF   DEPT: INF) (/staff/519/) Michel, Sebastian, Prof. Dr. (PROF   DEPT: INF) (/staff/524/) Schmitt, Jens, Prof. Dr. (PROF   DEPT: INF) (/staff/502/) Schweitzer, Pascal, Prof. Dr. (PROF   DEPT: INF) (/staff/333/) Dörr, Jörg, Dr. (WMA   DEPT: INF) (/staff/531/) Kuhn, Thomas, Dr. (WMA   DEPT: INF) (/staff/529/) Thees, Joachim, Dr. (WMA   DEPT: INF) (/staff/44/)
Area of study	[SO-POL] Political Science
Lifecycle-State	[NORM] Active

## Module Part #A

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+2U	INF-80-10-K-2 (/mhb/courses/INF-80-10-K-2/)	P	-	no	5.0	WiSe
2V+2U	INF-80-11-K-2 (/mhb/courses/INF-80-11-K-2/)	P	-	no	5.0	SuSe
2L	INF-02-21-K-2 (/mhb/courses/INF-02-21-K-2/)	P	-	no	4.0	SuSe

- About [INF-80-10-K-2] (/mhb/courses/INF-80-10-K-2/): Title: "Web-based Introduction to Programming"; Presence-Time: 56 h; Self-Study: 94 h
- About [INF-80-11-K-2] (/mhb/courses/INF-80-11-K-2/): Title: "Object-oriented Programming"; Presence-Time: 56 h; Self-Study: 94 h
- About [INF-02-21-K-2] (/mhb/courses/INF-02-21-K-2/): Title: "Programming Lab"; Presence-Time: 28 h; Self-Study: 92 h

## Module Part #B

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+1U	INF-02-13-K-2 (/mhb/courses/INF-02-13-K-2/)	WP	-	no	4.0	SuSe
2V+1U	INF-42-52-K-5 (/mhb/courses/INF-42-52-K-5/)	WP	-	no	4.0	irreg. WiSe

- About [INF-02-13-K-2] (/mhb/courses/INF-02-13-K-2/): Title: "Communication Systems"; Presence-Time: 42 h; Self-Study: 78 h
- About [INF-42-52-K-5] (/mhb/courses/INF-42-52-K-5/): Title: "Network Security"; Presence-Time: 42 h; Self-Study: 78 h

## Module Part #C

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+1U	INF-02-02-K-2 (/mhb/courses/INF-02-02-K-2/)	WP	-	no	4.0	SuSe
2V+1U	INF-31-55-K-6 (/mhb/courses/INF-31-55-K-6/)	WP	-	no	4.0	WiSe

- About [INF-02-02-K-2] (/mhb/courses/INF-02-02-K-2/): Title: "Modelling of Software Systems"; Presence-Time: 42 h; Self-Study: 78 h
- About [INF-31-55-K-6] (/mhb/courses/INF-31-55-K-6/): Title: "Requirements Engineering"; Presence-Time: 42 h; Self-Study: 78 h

## Module Part #D

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+1U	INF-00-31-K-3 (/mhb/courses/INF-00-31-K-3/)	WP	-	no	4.0	WiSe
2V+1U	INF-00-32-K-3 (/mhb/courses/INF-00-32-K-3/)	P	-	no	4.0	SuSe

- About [INF-00-31-K-3] (/mhb/courses/INF-00-31-K-3/): Title: "Web 2.0 Technologies 1 (Principles and Techniques)"; Presence-Time: 42 h; Self-Study: 78 h
- About [INF-00-32-K-3] (/mhb/courses/INF-00-32-K-3/): Title: "Web 2.0 Technologies 2 (Services, Security and Privacy)"; Presence-Time: 42 h; Self-Study: 78 h

## Module Part #E

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
4V+2U	INF-00-12-K-2 (/mhb/courses/INF-00-12-K-2/)	WP	-	no	8.0	SuSe

- About [INF-00-12-K-2] (/mhb/courses/INF-00-12-K-2/): Title: "Information Systems"; Presence-Time: 84 h; Self-Study: 156 h

## Module Part #F

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+1U	INF-02-11-K-2 (/mhb/courses/INF-02-11-K-2/)	WP	-	no	4.0	WiSe
2V+1U	INF-71-58-K-5 (/mhb/courses/INF-71-58-K-5/)	WP	-	no	4.0	SuSe

- About [INF-02-11-K-2] (/mhb/courses/INF-02-11-K-2/): Title: "Artificial Intelligence"; Presence-Time: 42 h; Self-Study: 78 h
- About [INF-71-58-K-5] (/mhb/courses/INF-71-58-K-5/): Title: "Collaborative Intelligence"; Presence-Time: 42 h; Self-Study: 78 h

## Module Part #G

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+1U	INF-16-52-K-5 (/mhb/courses/INF-16-52-K-5/)	WP	-	no	4.0	WiSe
2V+1U	INF-19-31-K-5 (/mhb/courses/INF-19-31-K-5/)	WP	-	no	4.0	WiSe

- About [INF-16-52-K-5] (/mhb/courses/INF-16-52-K-5/): Title: "Human Computer Interaction"; Presence-Time: 42 h; Self-Study:

78 h

- About [INF-19-31-K-5] (/mhb/courses/INF-19-31-K-5/): Title: "Data Visualization"; Presence-Time: 42 h; Self-Study: 78 h

## Examination achievement PL1

- Form of examination: **examination in form of partial achievements**
- Examination Frequency: each semester

Mündliche Prüfung in Wahlpflichtlinie Grundlagen der (Internet)Datensicherheit und Kommunikationssysteme (20-60 Minuten) oder Klausur (60-180 Minuten) in Wahlpflichtlinie Informationssysteme und Web 2.0 Technologie, Teilklausuren in den anderen Wahlpflichtlinien (Teilklausuren jeweils 60-90 Minuten) .

## Evaluation of grades

The grade of the module examination is also the module grade.

### Contents

#### From [INF-80-10-K-2] **Web-based Introduction to Programming** (/mhb/courses/INF-80-10-K-2/):

- Basic concepts of computer science: computer structure (von Neumann architecture), system software, compiler/interpreter
- Variables, data types, operators, expressions and commands (here Boolean algebra)
- Control structures (branching, loops, procedures, privacy)
- Arrays, strings (incl. string matching, regular expressions)
- files, directories
- Relational databases, their functionality and integration.
- Basic database queries and manipulation (SQL-Basics)

#### From [INF-80-11-K-2] **Object-oriented Programming** (/mhb/courses/INF-80-11-K-2/):

- Object orientation vs. procedural programming
- APIs and available functions
- Encapsulation, classes, constructors
- Inheritance, polymorphism, abstract classes, interfaces
- GUIs, event handling
- Exceptions

#### From [INF-02-21-K-2] **Programming Lab** (/mhb/courses/INF-02-21-K-2/):

- Specification of software requirements
- Development and implementation of algorithms as well as data modeling in programs
- Characteristics of programming frameworks, algorithms and programming languages
- Development environments and other programming tools (e.g., version control systems)
- Testing and debugging as well as software quality assurance (e.g., module and integration tests)
- Practical experiments on the runtime behavior of algorithms
- Development and usage of libraries for efficient data structures

#### From [INF-02-13-K-2] **Communication Systems** (/mhb/courses/INF-02-13-K-2/):

- Architecture models (service, protocol, layer architecture; Internet architecture, LAN architecture)
- Physical fundamentals (signal, bandwidth, physical media)
- Bit transmission (coding, modulation, multiplexing)
- Protection protocols (bit error, error coding, error handling, flow control)
- Protocols in local networks (media with multiple access, collision, arbitration, CSMA, CSMA/CD, token passing)
- Switching protocols (addressing, routing procedures, congestion control, Internetworking)

- Transport protocols (addressing, delayed duplicate problem, connection management, flow control, overload control)
- Application protocols (transmission of structured data, ASN.1, compression of data, addressing, application-specific communication services)

**From [INF-42-52-K-5] Network Security (/mhb/courses/INF-42-52-K-5/):**

- History of secure communications
- Symmetric cryptography: DES, 3DES, AES
- Asymmetric cryptography: RSA, Diffie-Hellman, El Gamal
- Cryptographic protocols: Needham-Schroeder, Kerberos, X.509
- Security protocols in the link layer: PPP, EAP, PPTP, L2TP
- Security protocols in the network layer: IPSec
- Security protocols in the transport layer: SSL/TLS, SSH
- Security in mobile systems
- Security in WLAN
- Security in wireless sensor networks

**From [INF-02-02-K-2] Modelling of Software Systems (/mhb/courses/INF-02-02-K-2/):**

Students learn basic modeling techniques about the software life cycle. The focus is on engineering techniques, such as UML modeling for object-oriented procedures and functionally decomposing models in analysis and design.

- UML modeling in analysis and design (class and object diagrams, communication and sequence diagrams and others)
- Functional decomposing models (Structured Analysis, Real Time Analysis, Structured Design)
- Modeling of non-functional properties
- Virtualization on the basis of models
- Traditional process models of software development (waterfall, V-model, prototypes, evolutionary, incremental and concurrent models)
- Project management models (network plan, Gantt chart, effort calculations)
- Models in quality assurance (especially model-based testing)

**From [INF-31-55-K-6] Requirements Engineering (/mhb/courses/INF-31-55-K-6/):**

- Elicitation techniques for gathering user requirements
- Approaches for modelling customer requirements (modeling techniques and processes)
- Transformation of customer requirements to developer requirements (functional / non-functional requirements)
- Negotiation and prioritization of requirements
- Variability management for requirements in a product line context
- Scoping of requirements

**From [INF-00-31-K-3] Web 2.0 Technologies 1 (Principles and Techniques) (/mhb/courses/INF-00-31-K-3/):**

- HTTP:
  - web Standards (interpretation, grammars)
  - web protocols (TCP/IP, addressing)
  - HTTP (standards, URI/URL/URN, request and response analysis, authentication, cookies)
  - analysis of interfaces and protocols
- HTML:
  - HTML (XML, SGML), history, concepts, DTDs
  - HTML5 (standard, introduction, document structure, semantic tags)
- CSS:
  - concepts, properties, extensions and development of the language
  - stylesheets (selectors, pseudo-classes, pseudo-elements, cascade)
  - layouts (box model, positioning, flexbox, grid)
  - web design (conception, animation, adaptive designs, media queries)
- Javascript:
  - concepts, sandbox, introduction to the language
  - APIs, DOM, DOM manipulation, event handling, jQuery

- Web server:
  - Concepts, web server, passive and active contents
- PHP (introduction, APIs)
  - parameter passing, Semantic URLs, form processing, postback
  - security, attack vectors, injections, XSS, escaping,
  - cookies, sessions, login, hashing

**From [INF-00-32-K-3] Web 2.0 Technologies 2 (Services, Security and Privacy) (/mhb/courses/INF-00-32-K-3/):**

- information systems:
  - concepts, relational databases, databases, database management systems
  - tables, attributes, relations, keys, foreign keys, conditions of integrity
  - modeling, ER models, cardinalities
- SQL:
  - concepts, queries, joins
  - scheme definition, types, data manipulation, transactions, ACID
  - views, prepared statements, stored procedures, trigger
- PHP:
  - MySQL-API, application scenarios, security, SQL-Injections, persistent injections
- Web application framework Django:
  - concepts, abstraction, maintainability, security
  - basic features of Python, OR mapper, interactive shell
  - basic features of Django, scheme definition, scheme migration, relations, admin interface
  - querysets, views, processing of requests, templates, inheritance, transactions, URL mapper, regular expressions
  - software management, practical case studies, form processing, middlewares, authentication, authorization
- Javascript APIs:
  - DOM manipulation, event handling, jQuery, asynchronous communication, AJAX, JSON
- security, privacy and authentication:
  - attack vectors, defense, injections, escaping
  - MITM, transport encryption TLS, certificates, CA, X509-PKI
  - cookie-stealing, session-stealing, session-fixation
  - cross-site Request Forgeries
  - Data protection and privacy in web services (user tracking, branding, privacy)

**From [INF-00-12-K-2] Information Systems (/mhb/courses/INF-00-12-K-2/):**

- Introduction and Basics
- Introduction to Information Retrieval (Vector Space Model, TF\*IDF)
- Models for Result Quality (Precision and Recall)
- Latent-Topic-Models (Singular Value Decomposition, LSI)
- Computation of Document Similarities (Shingling)
- Link Analysis and Markov Chains (PageRank)
- Data-Mining: Frequent-Itemset-Mining and Clustering (k-Means)
- Entity Relationship Modeling
- The Relational Model
- Relational Design Theory (Normal Forms)
- Rule-based Conjunctive Queries and Relational Calculus
- The SQL language (incl. recursion and window queries)
- Relational Algebra and Extensions (Aggregation, Duplicate Elimination, Bag Semantics)
- Views, Data Integrity, and Access Control
- Programming Principles of SQL-based Applications (JDBC)
- Database Triggers and User-Defined Functions
- DBS Architecture and Buffer Replacement Strategies
- Efficient Data Access through Indices (B/B+ Trees, Hashing, Bulkloading)

- Equivalence Rules of Relational Algebra (Logical Query Optimization and Selectivity Estimation)
- Transactions (ACID) and Serializability
- Selected topics of managing Big Data (NoSQL, CAP Theorem, Eventual Consistency)

**From [INF-02-11-K-2] Artificial Intelligence (/mhb/courses/INF-02-11-K-2/):**

- Various types of inference (deduction, induction, abduction)
- Basics of knowledge modelling and knowledge representation
- Basics of statistical learning
- Meaning of the search for the AI
- Basic concepts for combining statistical and symbolic approaches
- Knowledge of relevant application areas in practice
- Examples of complex AI (e.g. Alpha Go)

**From [INF-71-58-K-5] Collaborative Intelligence (/mhb/courses/INF-71-58-K-5/):**

- Methods for supporting personal knowledge work
- Organizational Memories
- Modeling of attention and activity context
- Basics of Information Retrieval
- Searching in location-, task-, and interest-based contexts
- Agile knowledge-workflows and emergent systems
- Enterprise platforms and social networks
- Factors of success and evaluation methods

**From [INF-16-52-K-5] Human Computer Interaction (/mhb/courses/INF-16-52-K-5/):**

The course introduces students to the theory and applications of human computer interaction (HCI). Students should achieve an understanding of human perception and psychology related to HCI, as well as learn about concepts and methods of interactive systems. The course builds on theoretical principles and numerous examples from research and practice.

Thematic priorities are:

- Goals and fundamentals of human computer interaction
- Human perception and cognition: fundamentals, preattentive perception
- Relations between psychology and interaction design
- Hardware used for man-machine interaction (I/O-devices)
- Human-centered approaches
- Usability: definitions and standards, measuring usability
- User Analysis & User Modeling, Task Analysis & Task Modeling
- Interaction models, interaction styles
- Scalability
- Interaction metaphors: basics, examples
- Evaluation: methods, techniques, basics

In the exercises, the lecture topics will be deepened and expanded. For this, the students work through current, lecture-related publications of the most important HCI conferences (e.g., CHI, UIST, IUI, Interact). Second, the prototypical implementation (from paper mock-up to concrete implementation, e.g., in Flash or HTML5) and evaluation of user interfaces is practiced in small groups.

**From [INF-19-31-K-5] Data Visualization (/mhb/courses/INF-19-31-K-5/):**

- Formal fundamentals
  - Visualization pipeline
  - Human perception and laws of form
  - Characteristics of data
  - Visual coding and its systematization
  - Interaction mechanisms

- Visualization of univariate data
  - Corridors visual mappings
  - Discussion of the approaches
  - Design guidelines and sources of error
- Visualization of multivariate data
  - Direct mapping procedures
  - Performant implementations
  - Linear projections in the visualization
- Visualization of graphs
  - Design strategies
  - Tree representations
  - Directed and undirected graphs
- Scalar field visualization
  - Representation of fields on the computer
  - Colormapping
  - Basic procedures in 2D and 3D

## Competencies / intended learning achievements

Die Studierenden kennen und verstehen grundlegend ausgewählte Themen der Informatik, deren Technik, aber auch dazugehörige Aspekte wie Sicherheit und können Beziehungen zu sozialwissenschaftlichen Fragestellungen herstellen. Dies gilt vor allem für neuere Themen der Informatik wie Künstliche Intelligenz und Mensch-Maschine-Interaktion. Die Studierenden können auch Themen der Informatik für die sozialwissenschaftliche Ausbildung nützlich machen, zum Beispiel durch Visualisierungsstrategien.

## Requirements for attendance of the module (informal)

None

- Notice: Some Courses have informal requirements for attendance:
  - #A: [INF-02-21-K-2] Programming Lab (2L, 4.0 LP) (P: Obligatory) (/mhb/courses/INF-02-21-K-2/#teilnahmevor-5593)
  - #B: [INF-42-52-K-5] Network Security (2V+1U, 4.0 LP) (WP: Obligation to choose) (/mhb/courses/INF-42-52-K-5/#teilnahmevor-5503)
  - #C: [INF-02-02-K-2] Modelling of Software Systems (2V+1U, 4.0 LP) (WP: Obligation to choose) (/mhb/courses/INF-02-02-K-2/#teilnahmevor-5602)
  - #D: [INF-00-31-K-3] Web 2.0 Technologies 1 (Principles and Techniques) (2V+1U, 4.0 LP) (WP: Obligation to choose) (/mhb/courses/INF-00-31-K-3/#teilnahmevor-5469)
  - #D: [INF-00-32-K-3] Web 2.0 Technologies 2 (Services, Security and Privacy) (2V+1U, 4.0 LP) (P: Obligatory) (/mhb/courses/INF-00-32-K-3/#teilnahmevor-5470)
  - #E: [INF-00-12-K-2] Information Systems (4V+2U, 8.0 LP) (WP: Obligation to choose) (/mhb/courses/INF-00-12-K-2/#teilnahmevor-5614)
  - #F: [INF-02-11-K-2] Artificial Intelligence (2V+1U, 4.0 LP) (WP: Obligation to choose) (/mhb/courses/INF-02-11-K-2/#teilnahmevor-5499)
  - #F: [INF-71-58-K-5] Collaborative Intelligence (2V+1U, 4.0 LP) (WP: Obligation to choose) (/mhb/courses/INF-71-58-K-5/#teilnahmevor-5541)
  - #G: [INF-16-52-K-5] Human Computer Interaction (2V+1U, 4.0 LP) (WP: Obligation to choose) (/mhb/courses/INF-16-52-K-5/#teilnahmevor-5471)
  - #G: [INF-19-31-K-5] Data Visualization (2V+1U, 4.0 LP) (WP: Obligation to choose) (/mhb/courses/INF-19-31-K-5/#teilnahmevor-5638)

## Requirements for attendance of the module (formal)

None

References to Module / Module Number [SO-02-2151-M-6]



<b>Course of Study</b>	<b>Section</b>	<b>Choice/Obligation</b>
[SO-88A.646-SG] M.A. Integrative Social Science (/mhb/FB-SO/cos-550/)	[Section (non-specific)] M.A. Integrative Sozialwissenschaft (ab WS 20/21)	[WP] Compulsory Elective

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