

Module Handbook for the Degree Programme (M.Sc.) *Digital Technologies in Architecture and Design* DTAD

Pflichtmodule

Module code	Module title	Degree programme	Faculty
MA.DT.P1	Project Module I	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator	Professor Computer Science in Architecture and Urbanism		
Participating professorships	Professorship Computer Science in Architecture and Urbanism Professorship Theory and History of Design Professorship Interface Design Professorship Emerging Technologies and Design		
Type of module	Compulsory module		
Teaching semester/frequency/duration	One semester Annually in the winter semester Weekly		
Recommended semester for taking this module	1 st semester		
Number of credit points (ECTS)	18 CP		
Student Workload	Face-to-face/online classes	126 h	
	Self-study	270 h	
	Examination preparation	144 h	
Requirements for the award of credit points	graphically, written/oral examination and digital submission, prototype development		
Language of instruction	English		
Prerequisites for this module	None		
Module components	introductionary project 8 credit hours and seminar 4 credit hours		
Programmes in which this module can be taken	Digital Technologies in Architecture and Design (M.Sc.)		
Registration modalities	Registration via the online course catalogue		
Comment	Contact and attendance hours as well as individual consultations, are part of the project		
Learning outcomes	The project module I provides an in-depth introduction to the teaching areas of the involved professorships and enables students with different levels of expertise in various subjects to		

	engage in an exploratory examination of the specific issues of the study programme. The module is structured into sub-projects (context analysis, context design drafting, interface design, introduction to academic work, presentation, prototype development), each of which is supervised from an interdisciplinary perspective. The introductory project module 1 aims to impart conceptual competence to students and develop their ability to work interdisciplinary. The transmission of a scholarly culture of debate, architectural-design criticism skills, and the generation of innovative approaches are core objectives of the project.
Content	The project module I establishes interdisciplinary connections between the teaching areas of the participating professorships. A common theme is addressed from the perspective of the professorships through presentations and sub-projects. In addition to the project module, a compulsory module (e. g. Design Theory 1) and elective modules for theoretical or design-focused specialization are offered. The project module I aims to provide students with different academic backgrounds with a common foundation for the degree programme. The module includes training in digital and printed documentation in various formats (academic text, drawing, model). The summary of project results and the defense of the work take place in a public presentation.
Teaching and learning methods	Lectures by professors of the programme, external expert presentations, and workshops are included in the project. Introduction to the problem through lectures, exercises and presentations Project work with weekly consultations Intermediate and final presentation (multimedia: poster, set of slides, animation, prototype)
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.P2	Project Module II	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator		Computer Science in Architecture and Urbanism	
Participating professorships		Professorship Computer Science in Architecture and Urbanism Professorship Human-Computer Interaction Professorship Interface Design Professorship Emerging Technologies and Design all professorships involved in the study programme who offer a course in the respective semester	
Type of module		Compulsory module	
Teaching semester/frequency/duration		One semester Annually in the summer semester Weekly	
Recommended semester for taking this module		2 nd semester	
Number of credit points (ECTS)		18 CP	
Student workload		Online-in-person lectures and courses	126 h
		Self-study	270 h
		Examination preparation	144 h
Requirements for the award of this module		As a rule, the performance record consists of: Short presentation, term paper and final presentation.	
Language of instruction		English	
Prerequisites for this module		None	
Module components		Design project 8 credit hours and seminar 4 credit hours	
Programmes in which this module can be taken		Digital Technologies in Architecture and Design (M.Sc.) Architektur (M.Sc.) Urbanistik (M.Sc.) European Urban Studies (M.Sc.)	
Registration modalities		Registration via the online course catalogue	
Comments			

Learning outcomes	After completing the module, students will be able to solve design problems using computer-based methods. On the one hand, they must master the methods for generating, analyzing and optimizing designs (seminar part). On the other hand, they should be able to apply these methods to a complex problem by developing their own problem-solving strategy. The formal thinking and programming skills taught as part of the module are regarded as important foundations for the creative use of new media.
Content	In the project module, computer-based methods are applied to a specific problem area (e.g. design of a city/urban district or a building with a specific use). For the respective problem area evaluation criteria and basic principles for ensuring these criteria in order to develop a deeper understanding of the respective subject area. In addition, suitable methods for dealing with the problem are taught (seminar component) and deepened by applying them to the problem (e. g. city/building simulation, user evaluation using VR). Students are also introduced to the subject area of design/planning methodology. This forms the background knowledge to develop an individual problem-solving strategy.
Teaching and learning methods	Introduction to the problem through lectures, exercises and presentations Project work with weekly consultations Intermediate and final presentation (multimedia: poster, set of slides, animation, prototype)
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.P3	Project Module III	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator		Professor Computer Science in Architecture and Urbanism	
Participating professorships		Professorship Computer Science in Architecture and Urbanism Professorship Human-Computer Interaction Professorship Interface Design Professorship Emerging Technologies and Design all professorships involved in the study programme who offer a course in the respective semester	
Type of module		Compulsory module	
Teaching semester/frequency/ duration		One semester Annually in the winter semester Weekly	
Recommended semester for taking this module		3 rd semester	
Number of credit points (ECTS)		18 CP	
Student workload		Online/in-person lectures and courses	126 h
		Self-study	270 h
		Examination preparation	144 h
Requirements for the award of credit points		As a rule, the performance record consists of: Short presentation, term paper and final presentation.	
Language of instruction		English	
Prerequisites for this module		None	
Module components		Design project 8 credit hours and seminar 4 credit hours	
Programmes in which this module can be taken		Digital Technologies in Architecture and Design (M.Sc.) Architektur (M.Sc.) Urbanistik (M.Sc.) European Urban Studies (M.Sc)	
Registration modalities		Registration via the online course catalogue	
Comments			

Learning outcomes	After completing the module, students will be able to solve design problems using computer-based methods. On the one hand, they must master the methods for generating, analyzing and optimising designs (seminar part). On the other hand, they should be able to apply these methods to a complex problem by developing their own problem-solving strategy. The formal thinking and programming skills taught as part of the module are regarded as important foundations for the creative use of new media.
Content	In the project module, computer-based methods are applied to a specific problem area (e.g. design of a city/urban district or a building with a specific use). For the respective problem area evaluation criteria and basic principles for ensuring these criteria in order to develop a deeper understanding of the respective subject area. In addition, suitable methods for dealing with the problem are taught (seminar component) and deepened by applying them to the problem (e. g. city/building simulation, user evaluation using VR). Students are also introduced to the subject area of design/planning methodology. This forms the background knowledge to develop an individual problem-solving strategy.
Teaching and learning methods	Introduction to the problem through lectures, exercises and presentations Project work with weekly consultations Intermediate and final presentation (multimedia: poster, set of slides, animation, prototype)
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.P4	Design Theory 1	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator	Professor Design Theory and Design Research		
Participating professorships	Professorship Design Theory and Design Research		
Type of module	Compulsory module		
Teaching semester/frequency/duration	One semester Annually in the winter semester Weekly		
Recommended semester for taking this module	1 st semester		
Number of credit points (ECTS)	6 CP		
Student Workload	in-class study	48 h	
	self-study	62 h	
	exam preparation (assignment)	70 h	
Requirements for the award of credit points	Written assignment		
Language of instruction	English		
Prerequisistes for this module	None		
Module components	n/a		
Programmes in which this module can be taken	Digital Technologies in Architecture and Design (M.Sc.) Human-Computer Interaction (M.Sc.) Produktdesign (M.A.)		
Registration modalities	Registration via the online course catalogue		
Comments	The seminar can be taken in combination with the DTAD project module I.		
Learning outcomes	The course focuses on the introduction of key theoretical positions, paradigms and processes of the digital in architecture and design, and discusses diverse aspects of digital technology from a multi-disciplinary, multi-cultural, and, ultimately, multi-dimensional perspective. As such, the course examines the transformative momentum of the digital and its seamless integration into everyday culture, while looking at the role of architecture and design in the construction of respective identities, agencies and realities. Besides establishing a fundamental yet wider understanding of the digital in		

	architecture and design, the course serves, at the same time, as theoretical and scientific grounding of the 1st semester project module (Einführungsprojekt-I). When having successfully attended the semester, students are able a) to understand key definitions, terminologies and discourses of the digital in architecture and design; b) to identify and understand respective media, methods and practices; and c) to transfer gained knowledge to own studies and projects.
Content	The course offers a fundamental introduction to the digital and fosters an understanding of digital technologies as an intercultural, intersectional, and interdisciplinary field of cultural production. It does so by exploring new understandings of how the digital is constructed, exercised, and implemented by examining different formulations and theories centered around the Digital Turn, and respective connections to science and technology studies, cultural materialism, and social history. On that scope, the course provides a broad overview of specific theoretical discourses with in-depth exercises and analysis of key positions and perspectives, such as, for example: Haraway's "Cyborg Manifesto", Bennett's "Vibrant Matter", Flusser's "Techno-images", Negroponte's "Soft Machines", or Gershenfeld's "Talking Things".
Teaching and learning methods	Trialectic format: Individual input, plus accompanying presentation and discussion rounds. At the end of the semester: Final written assignment.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.P5	Design Theory 2	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator		Professor of Design Theory and Design Research	
Participating professorships		Professorship Design Theory and Design Research	
Type of module		Compulsory module	
Teaching semester/frequency/duration		One semester Annually in the summer semester Weekly	
Recommended semester for taking this module		2 nd semester	
Number of credit points (ECTS)		6 CP	
Student Workload		in-class study	34 h
		self-study	34 h
		exam preparation and assignment	112 h
Requirements for the award of credit points		Written exam/written assignment	
Language of instruction		English	
Prerequisites for this module		Admission DTAD (M.Sc.)	
Module components		n/a	
Programmes in which this modules can be taken		Digital Technologies in Architecture and Design (M.Sc.) Connectability within DTAD: Design Theory 3 Connectability within DTAD: Introduction to Scientific Work Human-Computer Interaction (M.Sc.) Product Design (M.A.)	
Registration modalities		Registration via the online course catalogue	
Comments		n/a	
Learning outcomes		The course focuses on contemporary digital culture in architecture and design, and, as such, provides a fundamental overview of concurrent digital theories, methods and practices. Students will acquire a comprehensive overview and detailed understanding of the Digital Turn and its manifold manifestations. In this, they will be able to identify main potentials and challenges of digital architecture and design, and related technological, political and philosophical constructs. This	

	includes working with respective knowledge resources, such as literature, footage, exhibitions etc. When having successfully attended the semester, students are able a) to identify main paradigms of contemporary digital practices in architecture and design; b) to understand their specific technological, ideological and cultural contexts; and c) to foster respective research methods, strategies and tactics to transfer gained knowledge to own studies and projects.
Content	The course offers a theoretical and thematic overview of digital culture in architecture and design, ranging from the advent of computation during the 1990s to concurrent practices in the field of Machine Learning and Artificial Intelligence. Here, thematic lectures will be combined with in-depth exercises and analysis of key literature, and respective protagonists, projects and discourses. This includes, for example: design computation, virtual/augmented/mixed reality, internet of things, digital materiality and programmable matter, human-centred design, artificial intelligence, user-experience design, digital property and digital labor, smart cities and infrastructures, and digital sustainability.
Teaching and learning methods	Trialectic format: Individual input lectures, plus accompanying exercises and discussion rounds. At the end of the semester: Final exam and/or assignment/s (both written).
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.P6	Design Theory 3	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator		Professor Design Theory and Design Research	
Participating professorships		Professorship Design Theory and Design Research	
Type of module		Compulsory module	
Teaching semester/frequency/duration		One semester Annually in the winter semester Weekly	
Recommended semester for taking this module			
Number of credits (ECTS)		6 CP	
Student Workload	in-class study	34 h	
	self-study	34 h	
	exam preparation and assignment	112 h	
Requirements for the award of credit points		Written exam/written assignment	
Language of instruction		English	
Prerequisites for this module		Admission <i>DTAD</i> (M.Sc.)	
Module components		n/a	
Programmes in which this module can be taken		<i>Digital Technologies in Architecture and Design</i> (M.Sc.) Connectability within <i>DTAD</i> (M.Sc.): Design Theory 2 Connectability within <i>DTAD</i> (M.Sc.): Introduction to Scientific Work <i>Human-Computer Interaction</i> (M.Sc.) <i>Product Design</i> (M.A.)	
Registraion modalities		Registration via the online course catalogue	
Comments		n/a	
Learning outcomes		The course provides students with a fundamental introduction to the history of digital culture, focusing particularly on the emergence of computation and their wider implications for the creative professions. As such, students become acquainted with relevant approaches and discourses in the history of digital technologies, digital epistemologies and digital discourses, and, as such, will learn to critically reflect on concurrent computational design concepts, methods and techniques, and to	

	work with respective contexts, literature and other knowledge resources. When having successfully attended the course, students are able a) to oversee; b) to understand; and c) to contextualize emerging digital practices in architecture and design, and to transfer gained knowledge towards own studies and projects.
Inhalte	The course offers a historical and thematic overview of digital culture from the 18th up to the 20th century. Thematic sessions will be combined with in-depth discussions, exercises, and analysis of respective literature, projects and discourses; themes will cover, for example, the advent of modern tabulating and computing machinery, the emergence of information societies, the introduction of warfare technologies and mass media; the invention of code and computer industries; patterns of dissemination and political influence; the rise of artificial intelligence and cybernetics, the disruption of the digital turn and the democratization of the digital in general.
Lehr-/Lernformate:	Trialectic format: Individual input lectures, plus accompanying exercises and discussion rounds. At the end of the semester: Final exam and/or assignment/s (both written).
Literatur	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.P4-1 MA.DT.P5-1 MA.DT.P6-1	Introduction to Scientific Work	<i>Digital Technologies in Architecture and Design</i> (M.Sc.)	Architecture and Urbanism
Module coordinator		Amongst others: Professor Design Theory and Design Research	
Participating professorships		n/a	
Type of module		Compulsory module	
Teaching semester/frequency/duration		Two semesters Annually in the summer semester and the following winter semester Blocked sessions	
Recommended semester for taking this module		2 nd and 3 rd semester	
Number of credit points (ECTS)		3 CP	
Student Workload		in-class study	24 h
		self-study	36 h
		assignment	40 h
Requirements for the award of credit points		Written assignment	
Language of instruction		English	
Prerequisites for this module		None	
Module components		n/a	
Programmes in which this module can be taken		<i>Digital Technologies in Architecture and Design</i> (M.Sc.) Connectability within <i>DTAD</i> (M.Sc.): Design Theory 1, 2, 3 <i>Integrated Urban Development and Design</i> (M.Sc.) <i>Product Design</i> (M.A.)	
Registration modalities		Registration via the online course catalogue	
Comments		n/a	
Learning outcomes		The module provides students with a fundamental academic training – from basic terms and criteria, research strategies and literature management to citation styles, writing techniques and presentation of results. Operational and organizational issues as well as structural and methodological perspectives play an essential role, for example with regard to the structure of theoretical thesis work or the selection of qualitative and/or quantitative methods. In addition, the module includes an	

	introduction to key academic discourses and contexts (e.g. materialism, science-technology studies, cultural studies, etc.). The course thus has four main objectives: 1) to establish an academic foundation, including scientific approaches, methods and techniques; 2) to provide a basis for the presentation, contextualization and reflection of specific design positions, processes and projects; 3) to provide a basis for the conception and preparation of students' own scientific work and/or final theses; and 4) to facilitate joint discussions and exchange on academic work in the field of digital tools and discourses.
Content	In the module's first semester (2nd semester), general approaches, methods and techniques of academic work are discussed; this includes essential basic requirements, basic concepts, basic types, basic structures and basic techniques (e.g. in the area of topic selection, format definition, literature research, data collection, evaluation of results, contextualization, etc.) as well as their application by means of written and oral exercises in individual and/or group formats. In the second semester (3rd semester), acquired skills, abilities and competencies are deepened and transferred toward (topic-) specific documentation, exploration, and reflection approaches; these enable students to design and scientifically elaborate a well-founded project and/or master's thesis. Here, an essential focus is put on the discussion of targeted research and research methods as well as the general ability to contextualize and reflect.
Teaching and learning methods	Trialectic format: Individual input, plus accompanying presentation and discussion rounds. At the end of each semester: Final written assignment.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.P7	Master Module	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator	Professor Computer Science in der Architecture and Urbanism Professor Design Theory and Design Research Professor Interface Design Professor Urban Studies and Social Research Professor Emerging Technologies and Design		
Participating professorships	Professorship Computer Science in Architecture and Urbanism Professorship Design Theory and Design Research Professorship Interface Design Professorship Human-Computer Interaction Professorship Urban Studies and Social Research Professorship Emerging Technologies and Design and other professorships of the degree programme.		
Type of module	Compulsory module		
Teaching semester/frequency/duration	One semester every semester		
Recommended semster for taking this module	4 th semester		
Number of creidt points (ECTS)	24 CP + 3 CP colloquium + 3 CP presentation		
Student Workload	Face-to-face/ online classes	90 h	
	Self-study	720 h	
	Exam preparation	90 h	
Requirements for award of credit points	Documentation, presentation, colloquium, examination		
Language of instruction	English		
Prerequisites for this module	Successful completion of 3 rd semester DTAD (M.Sc.)		
Module components	colloquium 2 credit hours master's thesis		

	presentation 2 credit hours
Programmes in which this module can be taken	<i>Digital Technologies in Architecture and Design (M.Sc.)</i>
Registration modalities	Application with the examination office, The registration for the thesis master module (application including approval by the first and second examiners) must be completed by April 15 th or October 15 th at the latest, for the preparation of the master's thesis in the summer or winter semester.
Comments	Thesis application: online Consultation partners from faculties of architecture and urbanism, art and design and media.
Learning outcomes	The master's thesis should demonstrate that the candidate is capable of independently addressing a problem within the interface area of digital technologies in architecture and design, within a given timeframe, using scientific and/or artistic-design or technical methods, and to address this through practical design application and/or theoretical reflection. During the master's colloquium, the master's candidates present the current state of their work and receive feedback for further progress. The colloquium also serves to acquire presentation skills.
Content	An interdisciplinary project as a master's thesis with detailed elaborations in the interface areas between computer science in architecture and urbanism, design theory and design research, interface design, human-computer interaction, socio-scientific urban research, emerging technologies, and design. Upon consultation, other teaching contents and scientific topics can also become additional components of the master's thesis, for example, designing medial interventions in architectural space, interactive architectures, or developing new digital design methods.
Learning outcomes	The candidate is admitted to the master's thesis only after registration with the Examination Office at the beginning of the respective semester. The master's thesis is independently conducted by the students. They are supported through consultations with interdisciplinary supervisors. The master's colloquium serves for the presentation and discussion of the master's thesis: presentation of the chosen topic of the master's thesis and the progress achieved in a lecture (presentation). At the end, the master's thesis is presented and examined in a public presentation and defense before the examiners.
Reading list	-

Compulsory elective modules

Module code	Module title	Degree programme	Faculty
MA.DT.WP1	Digital Planning	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator		Professor Computer Science in Architecture and Urbanism	
Participating professorships		Professorship Computer Science in Architecture and Urbanism	
Type of module		Compulsory elective module	
Teaching semester/frequency/duration		One semester every semester Weekly	
Recommended semester for taking this module		Recommended for 1 st – 3 rd semesters	
Number of credit point (ECTS)		6 CP	
Student Workload		Face-to-face/Online sessions	36 h
		Self study	120 h
		Exam preparation	24 h
Requirements for the award of credit points		The performance record consists of: Homework, seminar paper and final presentation.	
Language of instruction		English	
Prerequisites for this module		Usually none. Admission <i>DTAD</i> (M.Sc.)	
Module components		Either 1 seminar with 6 CP or 2 seminars with 3 CP	
Programmes in which this module can be taken		The module can be offered in combination with the DTAD project module I. The module can also be taken by students of the Master's degree programmes in <i>Architecture</i> (M.Sc.), <i>Integrated Urban Development and Design</i> (M.Sc.) <i>European Urban Studies</i> (M.Sc.), or <i>MediaEcologies</i> (M.A.).	
Registration modalities		Registration via the online course catalogue	
Comments			
Learning outcomes		- Learning computer-based methods for analyzing and processing a design task - Ability to think in abstract models and a basic understanding of algorithms - Confidence in using planning software	

	- Introduction to the application of new technologies (e.g. artificial intelligence in the planning context)
Content	The module deals with design as a problem-solving process. In various formats computer-based methods for analyzing/processing and solving design problems are taught. These methods can be divided into two categories: Generation and Evaluation. Generation includes: - Parametric modeling - Building Information Modeling - Algorithms for automated generation and optimization Evaluation includes: - Methods for analyzing spatial configurations (e.g. visibility, accessibility, daylight) - Pre-occupancy evaluation using virtual reality In addition, the basics of scientific work (structure, implementation, evaluation and documentation of studies) are taught.
Teaching and learning methods	The seminars include introductions to the respective topics, problems and algorithms (partly face-to-face, partly online). These contents are deepened in homework assignments by applying them to a concrete example. At the end of the semester, all aspects taught must be combined in a small project or a small study and submitted as a seminar paper. and submitted as a seminar paper. In addition to the written paper, a presentation of the work (by means of slides and/or video).
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP2-1	Urban sociology	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator		Professor Urban Studies and Social Research	
Participating professorships		Professorship Urban Studies and Social Research	
Type of module		Compulsory elective module	
Teaching semester/frequency/duration		One semester Annually in the winter semester Weekly	
Recommended semester for taking this module		-	
Number of credit points (ECTS)		6 CP	
Student Workload		Face-to-face/Online sessions	45 h
		Self study	65 h
		Exam preparation	70 h
Requirments for the award of credit points		Academic paper	
Language of instruction		Englisch	
Prerequisites for this module		Admission DTAD (M.Sc.)	
Module components		Lecture and seminar	
Programmes in which this module can be taken		Digital Technologies in Architecture and Design (M.Sc.) European Urban Studies (M.Sc.)	
Registration modalities		Registration via the online course catalogue	
Comments			
Learning outcomes		The learning objective is orientation towards the model of the European city in the sense of a deeper understanding of the current city from a social science perspective. Development of competence of the ability to reflect as an urban planner and architect through the lens of historical, social and cultural knowledge. Understanding the socio-cultural dimensions of urban planning in different social contexts. Demand-based planning through an understanding of the dynamics of social change (as relates to youth cultures, ageing, service orientation, trends, influences of globalisation, etc.), the promotion of acceptance of socially oriented urban planning and participatory	

	processes of urban development. Acquisition of special urban sociological knowledge in seminar areas such as the city and transnationalisation, the city and global division of labour, and the city and reflective modernisation. Insights into empirical social research on urban developments. Basic knowledge of the Europeanisation process and the fundamental development trends in German, European and non-European cities. Students will be capable of understanding and preparing comparatively complex theories and subjects on the basis of specific selected topics and subject-specific content. They will have the capacity to critically reflect on issues and place them in context.
Content	The German city as an example of the development of European urbanism. Provides a comprehensive understanding of urban development in Germany and Europe in an international context. In-depth knowledge of the basic concepts of urban sociology and the social history of the city (segregation; integration; parallel society; stratification; gentrification; identity, etc.); the city and the modern. City life and urban characters; integration theories and neighbourhood planning. Space and place; social, functional and aesthetic urbanity; "new urbanity"; socio-cultural, symbolic and economic centrality; centrality and recentralisation in cross-cultural comparison; architecture and city in "reflective modernity;" urban theories from the global south, e.g. informality, and much more. Complex understanding of urban sociology against the backdrop of conflict and integration-theory discourses of empirical social research. Critical reflection on social processes, spatial constructions and state development. Comparative presentation of the development of German and European cities in the context of industrialisation, modernity, colonialism and post-colonialism.
Teaching and learning methods	The module is taught using various methods, with the didactic focus initially on the acquisition of in-depth knowledge on issues of social development. In addition to the classical lecture, there will be seminar and independent-learning formats that address elements of scientific-methodological work in addition to the subject-specific learning component. The learning objective is therefore the independent study of a topic and the development of an urban sociological thesis that can be pursued through independent research. This will form the basis of the final term paper.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP2-2	Urban Sociology/ Sociology of sustainable cities	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator	Professor Urban Studies and Social Research		
Participating professorships	Professorship Urban Studies and Social Research		
Type of module	Compulsory elective module		
Teaching semeser/frequency/duration	One semester Irregularly Weekly		
Recommended semester for taking this module	1 st , 2 nd or 3 rd semester		
Number of credit points (ECTS)	3 CP		
Student Workload	Face-to-face/Online sessions	28 (14 weeks à 2 h)	
	Self study	42 h	
	Exam preparation	20 h	
Requirements for the award of credit points	Presentation with written elaboration		
Language of instrcution	English		
Prerequisites for this module	Admission DTAD (M.Sc.) good English skills (at least B1)		
Module components	Closed teaching unit		
Programmes in which this modul can be taken	Suitable for all modules with sustainability as a thematic focus, also as an accompanying module to project modules (with a sustainability focus); also applicable in other programmes for modules that aim to deepen sustainability knowledge or where such knowledge is a prerequisite.		
Registration modalities	Registration via the online course catalogue		
Comments			
Learning outcomes	The course aims to provide knowledge on different approaches to sustainable urban development and the establishment of resilient urban structures (physical, organizational, social). It aims to enable participants to contribute to the implementation of sustainable and/or resilient solutions in urban development. It also seeks to develop analytical skills to assess the quality of implementation of sustainability goals using practical examples. Basic knowledge will be provided for participating in the process		

	evaluation of projects in urban development planning. The course also aims to raise awareness of the social, economic, and environmental consequences of urban planning measures.
Content	The seminar explores concepts, strategies and practices of sustainable urban development and the principles and practice of creating (more) resilient cities. Debates on urban form, transport and housing offer potential for local action, participation and capacity building. The emergence of the post-growth society is both, an overall concept framing roadmaps to sustainable and resilient cities, and a challenge to society and architecture, urban design and planning. Globalisation, urban resilience and changing lifestyles are brought together towards a sociology of a sustainable future.
Teaching and learning methods	Seminar, self study
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP3	Research in Urban Planning and Design	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator	Professor Urban Planning		
Praticipating professorships	Professorship Urban Planning Professorship Urban and Regional Design		
Type of module	Compulsory elective module		
Teaching semester/frequency/duration	One semester Annually in the winter semester Weekly		
Recommended semester for taking this module	1 st –3 rd semester		
Number of credits (ECTS)	3 CP		
Student Workload	Face-to-face/Online sessions	22,5 h	
	Self study	30 h	
	Exam preparation	37,5 h	
Requirements for the award of credit points	Lecture: "Research in Urban Planning and Design"; Certification. Written and graphical submission, Presentation		
Language of instruction	English		
Prerequisites for this module	Admission <i>DTAD</i> (M.Sc.)		
Module components	Lecture „Research in Urban Planning and Design"		
Programmes in which this module can be taken	<i>Digital Technologies in Architecture and Design</i> (M.Sc.) <i>Integrated Urban Development and Design</i> (M.Sc.)		
Registration modalities	Registration via the online course catalogue		
Comments			
Learning outcomes	The lecture provides an in-depth understanding of scientific terms, theories, discourses, and methods in the field of planning sciences and urban design.		
Content	Research in Urban Planning and Design The lecture connects the integrated disciplines of the module and develops their methods and research perspectives based on selected questions of urban development. Moreover, it introduces current international research discourses. It is jointly offered by two teaching areas: Urban and Regional Design and Urban Planning.		

Teaching and learning methods	In the joint lecture, the discipline-specific perspectives and methodological approaches to spatial development and planning, as well as their connections, are reflected upon.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP4	Kunst- und Kulturgeschichte der Architektur/ Aesthetics of the Natural	<i>Digital Technologies in Architecture and Design</i> (M.Sc.)	Architecture and Urbanism
Module coordinator	Professor Art and Cultural History		
Participating professorships	Professorship Art and Cultural History		
Type of module	Compulsory elective module		
Teaching semester/frequency/duration	One semester Every third semester Weekly		
Recommended semester for taking this module	1 st –3 rd semester		
Number of credits (ECTS)	6 CP		
Student Workload	face-to-face/Online sessions	60 h	
	Self-study	120 h	
	Exam preparation	-	
Requirements for the award of credit points	2 Seminars: 1 presentation and 1 written essay (approximately 15 pages) or 1 presentation and 1 oral examination or 1 Lecture: 1 exam or 1 oral examination 1 Seminar: 1 written essay (approximately 15 pages) or 1 oral examination Overall grade: Grade of the written essay or exam/oral examination; other module achievements must be completed or passed.		
Language of instruction	English		
Prerequisites for this module	Admission <i>DTAD</i> (M.Sc.)		
Module components	2 seminars or 1 lecture/1 seminar		
Programmes in which this module can be taken	<i>Digital Technologies in Architecture and Design</i> (M.Sc.) <i>MediaEcologies</i> (M.A.)		
Registration modalities	Registration via the online course catalogue		
Comments	Regular attendance in all sub-events of the module is strongly recommended.		
Learning outcomes	The learning objective is to develop and deepen historical and contemporary positions in nature aesthetics, which serve as the basis for understanding theoretical, historical, and epistemological aspects of relevant aesthetic theories and		

	practices. Theoretical orientation. Clarification of terminology. Development of individual research approaches.
Content	"The natural" is something different from "nature": it refers to objects, phenomena, and processes that are perceived as natural—regardless of whether they truly are or not. Therefore, the natural is always associated with an aesthetics, with certain forms of sensation, perception, and experience that can make something entirely artificial appear natural—whether it be paintings, screens, or virtual realities. The aim of this module is to deepen the understanding of media studies by referring to the art and cultural history of modernity, exploring the diverse ways in which the effect of the natural is produced and experienced. It sheds light on historical and contemporary perspectives on the aesthetics of the natural and challenges students to critically reflect on the status and role of nature aesthetics in modernity—especially in light of the ecological crisis of the present.
Teaching and learning methods	Lecture: Frontalunterricht: A lecturer-centered approach where information is presented directly. Lehrgespräch: Discussion between lecturers and students to clarify specific points. Seminar: Lehrgespräch: Discussion between lecturers and students to clarify specific points. Gruppendiskussion: Students exchange opinions on a specific topic.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP5-1	Medieninformatik / Human-Computer Interaction	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator	Professor Human-Computer Interaction		
Participating professorships	Professorship Human-Computer Interaktion (HCI)		
Type of module	Compulsory elective module		
Teaching semester/frequency/duration	One semester Annually in the summer semester Weekly		
Recommended semester for taking this module	2 nd Semester		
Number of credit points (ECTS)	6 CP (3+1 credit hours)		
Student Workload	face-to-face/Online sessions	40 h	
	Self Study	114 h	
	Exam Preparation	26 h	
Requirements for the award of credits	Exam. Length: 120–150 minutes. In extraordinary cases, for didactic reasons, an oral examination (30–45 minutes) can be offered. Submission of assignments on a regular bases is precondition for admission to the exam.		
Language of instruction	English		
Prerequisites for this module	Admission DTAD (M.Sc.)		
Module components	Only one course (lecture + practical session)		
Programmes in which this module can be taken	Digital Technologies in Architecture and Design (M.Sc.)		
Registration Modality	Application by e-mail, attendance of first lectures and practical sessions.		
Comments			
Learning outcomes	The students know the terms and methods mentioned under 'Content' and can explain them. They understand and can justify: what constitutes usability, and why good usability is important for successful use of software systems, Which characteristics of human perception and cognition influence usability,		

	why understanding the context of use as well as user needs and characteristics is central to the development of task-appropriate systems, the basic principles of a user-centered design process Which methods can be used to elicit requirements and what needs to be taken into account in this, the importance of prototyping, user testing, and theories and models about users and their behavior, why new technologies lead to development of new interaction methods and can create new usability problems Students are able to apply this knowledge to simple example scenarios. They can analyze and evaluate interfaces with regard to consequences for processes of human perception and cognition and identify common problems. They can analyze and evaluate example scenarios and systems with regard to usability. They can design simple user interfaces taking into account usability principles and the basics of human perception and cognition. They can also transfer and apply their knowledge to more demanding problems or more complex example scenarios For such examples, they can decide whether these adhere to or violate usability principles or principles of user-centered design, and justify their assessment. They can generate solutions for selected classes of usability problems. For given scenarios, they can develop a suggestion for the procedure of a user-centered design process and justify their choice of method. Students can practically apply the methods taught and their knowledge in the context of simple example scenarios e.g. develop paper prototypes, carry out a simple usability test, determine system requirements, ... e.g. analyze an interface with regard to grouping of control elements/display or its requirements for attention and memory and evaluate its suitability for general and special user groups.
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	In addition, social skills and key qualifications are practiced in group work on specific problems and tasks.
Content	Process of user-centered design (requirements analysis, prototyping, evaluation) Basic principles of software ergonomics and usability, design rules and principles, such as affordances, constraints, mapping, etc. Mental models, interface metaphors, interaction styles, Basic methods of user research (interviews, focus groups, observation, log file analysis, usability testing, field studies, experiment) The rights of participants in user studies (informed consent etc.) Documentation methods for requirements analysis (personas, storyboards, user profiles), Design methods and tools (paper prototyping, Wizard of Oz, video prototypes, horizontal and vertical prototypes), Core interaction types and styles as well as input and output technologies (historical and modern, including robotics, VR, AR, tangible interaction...), the role of interaction metaphors and their advantages and disadvantages, Descriptive and predictive modeling methods of HCI (Hierarchical Task Analysis, Fitts Law, Keystroke-Level Model etc.)
Teaching and learning methods	Lectures and practical exercises combined with individual and group work on theoretical and practical aspects of the content. The practical exercises serve to deepen the content. These regular practice tasks have students continuously engage with the lecture content. Assignments contain elements of project-oriented group work on concrete example problems and scenarios (problem-based learning). The methods taught are used and applied on an example base and the taught knowledge is put into practice. After correction of the submitted exercises by the teaching team, these are returned to students with comments. Exemplary solutions and typical errors are discussed in the classroom phase. Assignments include a maximum of 6 task sheets spread over the semester. Research assistants and student tutors from higher semesters supervise the students in the practical sessions and, together with the lecturers, are available for questions and discussions. The course consists of 1 to 2 weekly 90-minute lectures as well as 90-minute practical sessions, which typically take place every two weeks (one of the lectures alternates with the practical sessions). Regular work on assignments and active participation in practical sessions serves, among other things, students' self-

	assessment and is recommended for deepening understanding of the taught content. The module teaches practical, methodological and theoretical knowledge at an introductory level, which is tested in an exam.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP6	Medientheorie und Wissenschaftsgeschichte/ The Anthropocene	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator		Professor Medientheorie und Wissenschaftsgeschichte	
Participating professorships		Professorship Medientheorie und Wissenschaftsgeschichte	
Type of module		Compulsory elective module	
Teaching semester/frequency/duration		One semester Every sixth semester in the winter semester Weekly	
Recommended semester for taking this module		1 st –3 rd semester	
Number of credit points (ECTS)		6 CP	
Student Workload		Face-to-face/ Online sessions	60 h
		Self study	120 h
		Exam preparation	-
Requirements for the award of credit points		2 Seminars: 1 presentation and 1 written essay (approximately 15 pages) or 1 presentation and 1 oral examination or 1 Lecture: 1 exam or 1 oral examination 1 Seminar: 1 written essay (approximately 15 pages) or 1 oral examination Overall grade: Grade of the written essay or exam/oral examination; other module achievements must be completed or passed.	
Language of instruction		English	
Prerequisites for this module		Admission DTAD (M.Sc.)	
Module components		2 seminars or 1 lecture/1 seminar	
Programmes in which this module can be taken		Digital Technologies in Architecture and Design (M.Sc.) MediaEcologies (M.A.)	
Registration modalities		Registration via the online course catalogue	
Comments			
Learning outcomes		Acquisition of specific knowledge about the connection between climate development and cultural or social history. Development of epistemic, political, and critical perspectives on the "Anthropocene". Ability to competently present and develop one's own research work in speech and writing.	

Content	The concept of the "Anthropocene" is central to the current ecological debate. It underscores that global phenomena such as climate are not only the subject of natural sciences but also fall within the purview of cultural and social history. Indeed, this is a crucial point of the concept: what was long seen as simply Earth's history is revealed, with the Anthropocene, as a development in which humanity significantly alters the natural environment—increasingly not only locally, but globally. The module examines the complex relationships between climate change knowledge formation and the various approaches to historiography over time. Students are encouraged to critically question how political and media forces shape and influence both climate knowledge and historical narratives.
Teaching and learning methods	Lecture: Frontalunterricht: Lecturer-centered approach where information is presented directly. Lehrgespräch: Discussion between lecturers and students to clarify specific points. Seminar: Lehrgespräch: Discussion between lecturers and students to clarify specific points. Gruppendiskussion: Students exchange opinions on a specific topic.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP7	Geschichte und Theorie der Kulturtechniken/ Computational Environments	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator		Professor History and Theory of Cultural Technologies	
Participatin professorships		Professorship History and Theory of Cultural Technologies	
Type of module		Compulsory elective module	
Teaching semester/frequency/duration		One semester Every sixth semester in the winter semester Weekly	
Recommended semester for taking this module		1 rd –3 rd semester	
Number of credit points (ECTS)		6 CP	
Student Workload		face-to-face/Online sessions	60 h
		Self-study	120 h
		Exam preparation	-
Requirements for the award of credit points		2 Seminars: 1 presentation and 1 written essay (approximately 15 pages) or 1 presentation and 1 oral examination or 1 Lecture: 1 exam or 1 oral examination 1 Seminar: 1 written essay (approximately 15 pages) or 1 oral examination Overall grade: Grade of the written essay or exam/oral examination; other module achievements must be completed or passed.	
Language of instruction		English	
Prerequisites for this module		Admission DTAD (M.Sc.)	
Module components		2 seminars or 1 lecture/ 1 seminar	
Programmes in which this module can be taken		Digital Technologies in Architecture and Design (M.Sc.) MediaEcologies (M.A.)	
Registration modalities		Registration via the online course catalogue	
Comments		Regular attendance in all sub-events of the module is strongly recommended.	
Learning outcomes		Acquisition of specialized knowledge about the objects and questions of media ecology from the perspective of cultural studies research. Acquisition of the competence for independent reflection and further development of media ecological approaches based on cultural studies research. Promotion of	

	historically informed and theoretically innovative thinking; promotion of the ability to independently reflect on complex issues appropriately in oral and written form.
Content	What is nowadays referred to as the "digital media environment" can hardly be adequately understood without the theory and history of cultural techniques. In fact, long before the emergence of "ubiquitous computing" and the "Internet of Things," there has been a development in which cultural techniques such as counting and calculating have become functions of spaces, architectures, and entire cities— in markets and administrations as well as in the mathematized environments of Gothic cathedrals. Against this backdrop, the study module focuses on the history of ubiquitous computing, the Internet of Things, the development of data extraction and transmission, sensor and computing technologies, as well as selected modeling technologies.
Teaching and learning methods	Lecture: Frontalunterricht: Lecturer-centered approach where information is presented directly. Lehrgespräch: Discussion between lecturers and students to clarify specific points. Seminar: Lehrgespräch: Discussion between lecturers and students to clarify specific points. Gruppendiskussion: Students exchange opinions on a specific topic.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP8-1	Virtuelle Realität und Visualisierung/ Virtual Reality	Digital Technologies in Architecture and Design (M.Sc.)	Architecture and Urbanism
Module coordinator	Professor Virtual Reality and Visualization		
Participating professorships	Professorship Virtual Reality and Visualization		
Type of module	Compulsory elective module		
Teaching semester/frequency/duration	One semester Each semester Weekly		
Recommended semester for taking this module	1 st –3 rd semester		
Number of credits (ECTS)	6 CP		
Student Workload	face-to-face/Online sessions	45 h	
	Self study	90 h	
	Exam preparation	45 h	
Requirements for the award of credit points	Coursework in combination with a final exam (written or oral). Exam duration: 30–45 minutes (oral) or 90–150 minutes (written).		
Language of instruction	English		
Prerequisites for this module	Basic knowledge of HCI and computer graphics at bachelor level from a suitable previous degree, admission DTAD		
Module components			
Programmes in which this module can be taken	Computer Science for Digital Media (M.Sc.) Digital Technologies in Architecture and Design (M.Sc.)		
Registration modalities	Registration via the online course catalogue		
Comments			
Learning outcomes	The goal of this course is to provide students with the theoretical, technical and applied foundations of modern virtual reality systems, 3D Cinema, stereoscopic gaming and 3D user interfaces. Students should understand the following concepts, techniques and technical systems: • Scenograph technology • Viewing in 3D • 3D perception • Stereoscopic single- and multi-viewer display technology • Three-dimensional user interfaces and interaction techniques		

	Students should be able to apply the above concepts, techniques and their knowledge of technical solutions for solving concrete problems. Furthermore, they should be able identify and discuss the main usability factors of 3D interaction techniques, 3D interfaces and 3D display technology. In order to tackle problems from the virtual reality domain, students should master concepts and approaches such as • Computing stereoscopic projection parameters for various technical setups • Designing a scenegraph-based interactive virtual reality application that supports multiple users • Selecting navigation, selection and manipulation techniques for specific use cases • Using Fitts's law and the steering law to evaluate the performance of designs in selection and navigation tasks • Design and parametrization of transfer functions for the different types of sensors and tasks Students should develop an understanding of the fundamentals and the current state of research in virtual reality and make well-informed decision in this context. They should be able to discuss research problems, implement and adapt current approaches, perform basic evaluations and understand the limitations of the solutions. In addition, social and general transferable skills are trained via group work in the lab classes based on concrete problems and tasks.
Content	Main contents are: Stereoscopic Viewing Graphics and Scenegraph Basics Viewing Setups in Scenegraphs 3D User Interface Basics 3D Navigation, selection and manipulation 3D Manipulation 3D Input Devices 3D Display Technology Basics Stereoscopic Multi-User Display Technology Interaction and Collaboration in Multi-User Virtual Reality Introduction to Augmented/Mixed Reality
Teaching and learning methods	Lectures and practical lab sessions combined with individual and group-based work related to theoretical and practical aspects of the contents. Practical sessions can include project-oriented and lab work based on concrete problems (problem-based learning approach).

	Various approaches presented in lectures will be studied, in part practically through labs and assignments. Lab classes focus on implementing, testing and evaluating the techniques presented during the lectures. Postdoctoral researchers, doctoral students and teaching assistants are supervising the students. They are available for intensive discussions and immediate feedback. This module conveys method skills and theoretical and practical backgrounds, which are assessed via an oral or written exam, and through a larger, final assignment including group presentations. Practical skills and implementation competencies are assessed via coursework. Classes in this module consist of 2 credit hours of lecture and 2 credit hours practical session per week during the semester.
Reading list	This course is mostly based on recent research publications. References will be provided throughout the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP8-2	Virtuelle Realität und Visualisierung/ Visualisation	<i>Digital Technologies in Architecture and Design</i> (M.Sc.)	Architecture and Urbanism
Module coordinator		Professor Virtual Reality and Visualization	
Participating professorships		Professorship Virtual Reality and Visualization	
Type of module		Compulsory elective module	
Teaching semester/frequency/durarion		one Semester every Semester Weekly	
Recommended semester for taking this module		1 st –3 rd semester	
Number of credit points (ECTS)		6 CP	
Student Workload		face-to-face/Online sessions	45 h
		Self study	90 h
		Exam preparation	45 h
Requirements for the award of credit points		Coursework in combination with a final exam (written or oral). Exam duration: 30–45 minutes (oral) or 90–150 minutes (written).	
Language of instruction		English	
Prerequisites for this module		Basic knowledge of HCI and computer graphics at bachelor level from a suitable previous degree, admission DTAD	
Module components			
Programmes in which this module can be taken		<i>Computer Science for Digital Media</i> (M.Sc.) <i>Digital Technologies in Architecture and Design</i> (M.Sc.)	
Registration modatities		Registration via the online course catalogue	
Comments			
Learning outcomes		Within the scope of the module, students develop an understanding of the basic mathematical, algorithmic and technical methods and procedures for the representation of and interaction with measured, simulated or collected data. They can select, adapt, implement and evaluate these for new problems. Students are able to abstract at different levels: Problem abstraction: translation of the problem from a specific application domain into the visualization vocabulary.	

	Data abstraction: What is to be visualized? Task abstraction: Why do users want the data visualized? You know a wide range of basic visualization techniques and how they are structured Visual coding: How is the data represented? Interaction techniques: How to customize the view of the data and how to combine different views. Students are able to analyze and abstract data from an application domain and systematically select suitable visualization techniques and combine them with appropriate interaction techniques. They will also be able to apply their knowledge to challenging and more complex problems and assess the scalability of the selected techniques. The lab class enables students to develop, implement and test basic visualization techniques themselves. In addition, social and general transferable skills are trained via group work in the lab classes based on concrete problems and tasks.
Content	Core topics are: <u>Information visualization</u> Munzner's what-why-how analysis framework Basic interaction techniques Visualization techniques for tabular/multi-attribute data, set-based data, time-series data, trees, graphs, cartographic data, and text <u>Scientific visualization</u> Data types and mathematical basics Isolines and isosurfaces Direct volume rendering using ray casting Multi-resolution methods for volume data Flow visualization
Teaching and learning methods	Lectures and practical lab sessions combined with individual and group-based work related to theoretical and practical aspects of the contents. Practical sessions can include project-oriented and lab work based on concrete problems (problem-based learning approach). Various approaches presented in lectures will be studied, in part practically through labs and assignments. Lab classes focus on implementing, testing and evaluating the visualization approaches presented during the lectures. Postdoctoral researchers, doctoral students and teaching assistants are

	supervising the students. They are available for intensive discussions and immediate feedback. This module conveys method skills and theoretical and practical backgrounds, which are assessed via an oral or written exam, and through a larger, final assignment including group presentations. Practical skills and implementation competencies are assessed via coursework. Classes in this module consist of 2 credit hours of lecture and 2 credit hours practical session per week during the semester.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP5-2	Media informatics / Image Analysis and Object Recognition	Digital Technologies in Architecture and Design (M.Sc.)	Media
Module coordinator		Professor Computer Vision in Engineering	
Participating professorships		Professorship Computer Vision in Engineering	
Type of module		Compulsory elective module	
Teaching semester/frequency/duration		One Semester Annually in the summer semester Weekly	
Recommended semester for taking this module			
Number of credit points (ECTS)		6 CP	
Student Workload		Face-to-face/ online sessions	75 h
		Self-study	75 h
		Exam preparation	30 h
Requirements for the award of credit points		Successful participation in the exercises. Exam (90 mins.)	
Language of instruction		English	
Prerequisites for this module		Basic programming knowledge, Admission DTAD (Msc.)	
Module components		lecture (2 credit hours / 3 CP) exercises (1 credit hours / 1.5 CP) project (1 credit hours / 1.5 CP)	
Programmes in which this module can be taken		The module is offered for the following master's degree programmes: Human-Computer Interaction (HCI) (M.Sc.) Digital Engineering (DEM) (M.Sc.) Digital Technologies in Architecture and Design (DTAD) M.Sc.) Computer Science and Media (CS4DM) (M.Sc.)	
Registration modalities		Registration via the online course catalogue	
Comments			
Learning outcomes		The course provides an introduction to advanced concepts in image processing, image analysis, and object recognition. The	

	goal is to understand the principles, methods, and applications of computer vision from image processing to image understanding. Students will be introduced to the following topics: Image representation and enhancement Morphological and local filtering operators Corner and edge detection Frequency domain filtering Shape recognition using generalized Hough transform and Fourier descriptors Object recognition using Viola-Jones, SIFT-based matching, and implicit shape models Segmentation and clustering of image regions Deep learning for visual recognition Methods and strategies of pattern recognition Students should be able to apply the above-mentioned topics to solve computer vision problems. They should also recognize the limitations and constraints of the above-mentioned topics. Students should be able to formalize and generalize their own solutions using the concepts of image processing, image analysis, and object recognition mentioned above. Students should master concepts and approaches such as: Application-specific feature extraction Generation, learning, and application of models for object recognition Data-driven and model-driven processing strategies to address computer vision problems and their application to digital media. They should be able to understand proposed image analysis methods, compare different proposals for object recognition systems, make informed decisions about the preferred proposal, and, if necessary, find their own solutions to given computer vision problems. Students should develop an understanding of the current state of research in image analysis and object recognition. They should be able to address research problems under appropriate supervision.
Content	Exemplary contents include: Image processing Feature extraction Shape recognition Object recognition Image regions

	Machine learning
Teaching and learning methods	Lectures with exercises and a small project. The lectures provide the theoretical background, which is exemplarily applied in computer exercises and an individual project.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP5-3	Medieninformatik/ Photogrammetric Computer Vision	Digital Technologies in Architecture and Design (M.Sc.)	Media
Module coordinator	Professor Computer Vision in Engineering		
Participating professorships	Professorship Computer Vision in Engineering		
Type of module	Compulsory elective module		
Teaching semester/frequency/duration	One semester Annually in the winter semester Weekly		
Recommended semeser for taking this module			
Number of credit points (ECTS)	6 CP		
Student Workload	Face-to-face/ online sessions	75 h	
	Self-study	75 h	
	Exam preparation	30 h	
Requirement for the award of credit points	Successful participation in the exercises. Exam. (90 mins.)		
Language of instruction	English		
Prerequisites for this module	Basic programming knowledge		
Module components	lecture (2 credit hours / 3 CP) exercises (1 credit hours / 1.5 CP) Project (1 credit hours / 1.5 CP)		
Programmes in which this module can be taken	Computer Science and Media (CS4DM) (M.Sc.) Human-Computer Interaction (HCI) (M.Sc.) Digital Engineering (DEM) (M.Sc.) Digital Technologies in Architecture and Design (DTAD) (M.Sc.)		
Registration modalities	Registration via the online course catalogue		
Comments			
Learning outcomes	The course provides an introduction to the fundamentals of sensor orientation and 3D reconstruction. The goal is to understand the principles, methods, and applications of image-based measurement. Topics covered include algebraic projective geometry, image geometry, calibration, orientation procedures,		

	stereo image matching, and other methods for surface reconstruction. Specific learning objectives: Students will understand the essential principles of algebraic projective geometry and can apply this knowledge to the spatial 3D reconstruction of objects from images. They can model the image geometry prevalent during image acquisition and invert it for surface reconstruction. Students can determine perspective projections using direct linear transformation and understand the optical imaging properties of lenses. After the course, they can evaluate and select basic reconstruction methods. The accompanying exercises enable them to implement their own methods to calibrate important camera properties, determine the individual sensor positions and orientations from the images, and triangulate spatial object points.
Content	Exemplary contents include: Projective geometry Perspective projections with homogeneous coordinates Determination of linear transformations Robust parameter estimation Camera modeling Calibration, sensor orientation, and triangulation Optical imaging with lenses Bundle adjustment for multi-image geometries Stereo image processing Generation of stereo normal images Global strategies for dense image matching
Teaching and learning methods	Lectures with exercises and a small project. The lectures provide the theoretical background, which is exemplarily applied in computer exercises and an individual project.
Reading list	A current list will be announced before the start of the course.

Module code	Module title	Degree programme	Faculty
MA.DT.WP9	Basic Interface Design/ Technological Foundations of Sensors, Actors and Microcontrollers	<i>Digital Technologies in Architecture and Design (M.Sc.)</i>	Architecture and Urbanism
Module coordinator		Professor Interface Design	
Participating professorships		Professorship Interface Design	
Type of module		Compulsory elective module	
Teaching semester/frequency/duration		One Semester Annually in the winter semester Weekly	
Recommended semester for taking this module		1 st and 3 rd semester	
Number of credits (ECTS)		6 CP	
Student Workload		Präsenz-/Online Lehrveranstaltungen	36 h
		Selbststudium	120 h
		Prüfungsvorbereitung	24 h
Requirements for the award of credit points		Active participation and delivery of a course documentation according to the requirements of the teacher.	
Language of instruction		English	
Prerequisites for this module		Basic Knowledge of Electronics and the Arduino platform is helpful., Admission DTAD	
Module components			
Programmes in which this module can be taken		<i>Digital Technologies in Architecture and Design (M.Sc.)</i>	
Registratrion modalities		Registration via the online course catalogue	
Comments			
Learning outcomes		Foundational technical understanding of electronic circuits and the programming of microcontrollers (Arduino, etc.). Understand interactive media and circuits. Introduction to basic concepts of programming languages.	

	Acquire the competence to autonomously plan and realize electronic circuits for interactive applications.
Content	Introduction to working with electronic Sensors, Actors and the programming of Microcontrollers.
Teaching and learning methods	Workshop 4 CP, Self-directed studies 2 CP
Reading list	A current list will be announced before the start of the course.