Module Handbook

for the Bachelor Programs

B.A. Interaction Design
B.A. Product Management
B.Sc. Software Engineering

Updated: April 21, 2023 (Version 3.0.0)
Attachment to the Study and Examination Regulations for the Bachelor Study Program in Interaction Design, April 21, 2023 (Version 3.0.0)
Attachment to the Study and Examination Regulations for the Bachelor Study Program in Product Management, April 21, 2023 (Version 3.0.0)
Attachment to the Study and Examination Regulations for the Bachelor Study Program in Software Engineering, April 21, 2023 (Version 3.0.0)

Table of Contents

OS_01 | Introduction to Software Engineering

Details

Credits:	5 ECTS	Semester:	1 (Orientation)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	None	
Module Coordinator:	Dr. Frank Trollmann	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

Software is everywhere in today's world—from our homes to outer space, from medicine to digital products, software is everywhere we look and a part of everyday life. Having a basic understanding of what software is, how it can be used, and how to engage with software as a creator and not just as a user is a key part of technoliteracy and an essential skill of the 21st century. In this module, students gain an understanding of the most important aspects of software engineering. Students encounter contemporary best practices of the software development process and how to apply these in practice. Students select and schedule their own learning path based on a set of offerings and reflect on their choices.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the field of software engineering
- Apply domains of software engineering
- Write basic programs
- Understand basic software development processes
- Evaluate and select learning resources and learning methods for learning programming

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

OS_02 | Introduction to Interaction Design

Details

Credits:	5 ECTS	Semester:	1 (Orientation)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	None	
Module Coordinator:	Malith Prasanna Gunasekera	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

Students who successfully complete this module develop a basic understanding of Interaction Design and its application in both analog and digital contexts. Students are exposed to (and are required to deploy) a range of introductory methods, tools, and theories related to Interaction Design. Students explore topics (for example through design briefs or challenges) in groups or individually and through research, develop creative responses that are contextually appropriate. Students develop their knowledge and experience through engagement in Orientation Semester-specific workshops, peer-to-peer feedback and critique sessions, through learning-by-doing in project-focused work and reflective activities and outputs.

Qualification Objectives

Students who successfully pass this module are able to:

- Investigate a topic through the application of introductory primary research methods and analyses
- Develop creative responses that are contextually appropriate
- Select and iterate an appropriate/contextually relevant creative response
- Reflect on aspects of the module on an individual basis

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

OS_03 | Introduction to Product Management

Details

Credits:	5 ECTS	Semester:	1 (Orientation)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	None	
Module Coordinator:	Prof. Dr. Swantje Quoos	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

We live in a world of products. Almost everything that is designed and engineered in some way is made available to the world in the form of a product. The product mindset does not need to be only about commercial products. Product managers help to define and bring to life digital and physical solutions to real-world needs and problems, while ensuring the viability of the products and organizations which build them.

In this module, students gain a broad overview of product management perspectives and methods. Students understand key elements of product discovery and product strategy and apply them within guided exercises. Furthermore, students are introduced to the fundamental principles of agile product development, and they know the main aspects of the roles of product managers in organizations.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the basics of the field of product management
- Understand the basics of the product definition process
- Apply domains of product management
- Understand the basic professional and team competencies to solve problems in product management with self-awareness, empathy and a growth-mindset

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

OS_05 | Application of Project-Based Learning Methods

Details

Credits:	9 ECTS	Semester:	1 (Orientation)
Contact time:	60 hrs.	Frequency:	Annually
Self-study:	210 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	None	
Module Coordinator:	Malith Prasanna Gunasekera	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

Project-based learning (PBL) is the core pedagogic approach at CODE University of Applied Sciences in which students are engaged in complex, real-world projects that are linked to their studies and encourage them to develop inquiry and problem-solving abilities.

During this module students are exposed to key principles, methods, tools, and approaches of PBL which they will apply to a project that forms/is the synthesis of learning, outcomes, and outputs from OS_01, 02, 03. This is a practical module and students are expected to demonstrate a body of work that includes experiments, documentation, and reflection on practice throughout. The main objective is to provide students with sufficient background knowledge in Project-based learning that allows them to transition into core semester study.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand and utilize methods, tools and approaches of project-based learning
- Develop and iterate a collaborative student project
- Create tangible artifacts that are contextually appropriate
- Reflect on learning in a project-based learning environment

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_01 | Composition

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Martin Knobel	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

In this module, students learn the use of color, contrast, shapes, and proportions according to the gestalt principles and practice this through diverse applications. Students learn the fundamentals of photography, e.g. image composition, lighting and flash, aperture, and exposure. Students learn to use the medium of photography and other visual practice as an expressive and experimental tool.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the gestalt principles and interpret images accordingly
- Create diverse assets with different techniques that adhere to the gestalt principles
- Demonstrate understanding of image composition by developing experimental techniques, taking the nature of visual practice into account

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_02 | Generative Design

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Daniel Buzzo	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Generative Design teaches students about the exploration process and personal expression. The iterative writing and modification of software code becomes a personal expression, as it is done in an experimental and playful way. The goal is for students to build awareness of the creation process of computer-generated output.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand Generative Design, e.g. creating Sketches and multi-document Sketches, different renderers to create images, PDFs, animation, applications, and web interfaces
- Understand functions and libraries in this context: video, sound, PDF Export and Serial as well as important third-party libraries and third-party input devices

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_03 | Editorial Design

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Martin Knobel	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module is intended to introduce students to the fundamentals of visual communication practices. Additionally, this module introduces students to fundamental principles and applications of design, emphasizing critical social and cultural awareness of design issues and the development of technical skills. Students create typographically focused solutions to design challenges and explore the relationship between type and image. The module emphasizes ideation, combining visual and verbal elements, as well as the development of advanced layout skills and grid-based typographic structures. This module covers color theory and its application and lays the foundation for further study of design.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand and apply the use of grids for print media
- Understand how to build up a magazine
- Understand and apply how to create printed material in a professional way
- Create diverse editorial assets with a variety of visual languages
- Create and iterate on a flat plan
- Create diversity in editorial work (e.g., different formats like stickers, posters, etc.)which are added to the magazine
- Present visual work in a professional way

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_05 | Design History

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dinah Kübeck	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module provides a general overview of important designers. It encourages students to understand their own work and that of key practitioners in a historical, theoretical, social, and ethical framework. This background helps the student to reflect on their work in depth. The module also presents a future-oriented perspective for the student to utilize in their own work. Overall, this module helps the student to evolve critical thinking regarding design as a future-facing discipline.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand influential designers and important historical, theoretical, social, and ethical frameworks in design
- Apply this knowledge to reflect on their own work as well as the work of others
- Utilize a future-oriented perspective in design by incorporating important historical, social, and ethical aspects and up-to-date research and addressing these topics in complex conceptual and visual work

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_06 | Design Methods I

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Malith Prasanna Gunasekera	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Elective

Contents

In this module, students are provided with an introduction to design research through the utilization of primary research method(s) in order to gather data and develop insights. This module invites students to investigate a self-defined context in order to raise awareness about peoples' motivations, behaviors, assets, needs, desires, fears etc.

It is a practical module therefore students are expected to demonstrate a body of work that includes experiments, documentation and reflection on practice throughout.

Qualification Objectives

Students who successfully pass this module are able to:

- Investigate a topic through the use of a primary research method
- Analyze gathered data through contextually relevant methods/approaches
- Synthesize information from multiple perspectives to generate topic relevant insights
- Present work in a creative, coherent, and concise manner

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_09 | Design Strategy

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Malith Prasanna Gunasekera	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module sits at the intersection between interaction design and product management. It explores the new and emerging role for design in industry and its contribution to product innovation and value proposition. It provides students with an overview of how to determine what to make and do, why to do it, and how to innovate contextually, both immediately and over the long term. This further enables students to create meaningful products—services with character—by considering relevant touchpoints. Students learn techniques relating to market and brand analyses, predicting future scenarios, technology forecasting, and roadmapping for strategic design.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify and utilize a range of methods to assist in the strategic development of your project (e.g., stakeholder mapping, future scenarios, technology forecasting, storyboarding, user stories, etc.)
- Develop clear avenues for ‘creative outcome’ development (e.g., design product, service, experience, analog object, IoT, etc.) that are contextually appropriate
- Create project development milestones and/or time plans that are contextually appropriate and acknowledge local/global developments (e.g., technological, political, social)
- Communicate project work in a creative, coherent, and concise manner

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_10 | Brand Design

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Lara Schibelsky Godoy Piccolo	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Brand Design investigates how a company's values, vision, and mission are reflected in the respective brand's "look and feel" to specific target audiences. Students learn a process to support design decisions that consistently communicates the brand identity both visually (e.g. logo, color palette) and verbally (e.g. tone of voice).

Qualification Objectives

Students who successfully pass this module are able to:

- Understanding the fundamentals of brand design and defining a brand's core
- Use the knowledge built about the target audience and competitors to develop a brand positioning strategy
- Create a visual and verbal identity for a brand by choosing appropriate typography, logo, colors, voice, and tone that communicate the brand's message
- Critique the effectiveness of a brand's visual and verbal identities by evaluating how well they communicate the brand identity and resonate with the target audience

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_12 | Infographics

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dinah Kübeck	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

In this module, students learn how infographics transform information into concise images that are easy to understand. Messages can be communicated to the user in a succinct, visual way. This is done using graphic conventions and codes involving color, typography, diagrams, photographs, illustrations, pictograms, maps, and more. A historical overview shows the evolution from early infographics to interactive infographics in digital media and modern data visualization. The students examine how data can be transformed into memorable experiences that engage the user through visual installations and audio and graphic experimentation.

Qualification Objectives

Students who successfully pass this module are able to:

- Create expressive, concise infographics using data visualizations and different design techniques to elucidate complex topics with detailed data sets
- Design visualizations based on the viewer in mind
- Determine the type of visualization based on available data and goals

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_13 | Physical Interfaces I

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Daniel Buzzo	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

In this module, hardware and microcontrollers are used to teach an understanding of digital, physical interaction beyond the screen. Basic electronic circuits are created along with breadboard and electronic components. In workshops, students learn to work with sensors, motors, LEDs and other components driven by microcontrollers or their smartphones to create experiences that spark the user's interest and solve problems in unique ways. The overall aim of the workshops are to be experimental and creative in order to create playful interactions.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand and apply the use of microcontrollers, including crafting source code for microcontrollers
- Read and create circuit diagrams
- Understand and apply hardware for sketching in a diverse matter
- Understand and critique microcontroller-based prototypes in a constructive way
- Iterate on hardware sketches
- Understand and apply affordances with physical interfaces
- Create prototypes with hardware with the help of microcontrollers

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_17 | Extended Realities

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Daniel Buzzo	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

In a virtual or augmented reality, the user can interact with a computer-generated or real-image-based 3D environment through multimodal displays that support interaction through vision, hearing, and touch. Students who study this module examine the nature of virtual reality and receive an introduction to topics relating to the perception of virtual environments (e.g., stereo vision and sound localization). A range of display and input technologies (e.g., head-mounted displays, cubic projection displays, and tracking technologies) are explored. The module also focuses on navigation in diverse 3D structures.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the creation of 360° media with photography and motion imagery
- Utilize VR/AR tools and equipment
- Demonstrate understanding of the design techniques used in virtual reality and 3D modeling
- Compare the applicability of various VR technologies to given applications
- Apply understanding to the design of a VR or AR system to create an immersive experience unique to VR/AR by combining different design techniques and interface skills, possibly involving sound or other haptic or virtual feedback

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_19 | Responsive Design

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dinko Verzi	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module explores the theoretical, design-related, and technical aspects of responsive design and technology. Students learn about the history of web design and its evolution into responsive design. Using contemporary tools and methods, students learn how to create basic or advanced screen designs and/or HTML/CSS implementations based on responsive criteria and principles. Special emphasis lies in the various device types and screen sizes as well as user needs regarding this topic.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand how to think creatively in design, technology, and user needs in regard to a responsive website
- Apply creative thinking to design a website, produce a screen design, and/or implement these in HTML/CSS
- Understand placement, layout techniques, and typography and employ their knowledge on a project of their choice
- Evaluate their work and the work of others regarding responsive design

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_20 | Service Design

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Malith Prasanna Gunasekera	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Services are ubiquitous and their design utilizes a people-centered design process that is used by designers and organizations in order to develop better services. Service design adds value for users by exploring, understanding, and improving their experiences across the various stages of service and for service providers by enhancing their back-end operations.

This module takes students through the methods and tools used to build services that meet the needs of users. Students are taken through different aspects of service design such as how to bridge the research - design gap with user models, how to create scenarios that are contextually relevant and fit for purpose, how to evaluate service design outcomes based on guidelines and best practices in this context. This list is not exhaustive and constitutes some aspects of service design tools and methods.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand and describe the emergence of service design and its role/impact within society
- Identify and utilize a range of service design methods and tools within a self-defined context
- Synthesize information to develop a range of creative outcomes within a self-defined context
- Reflect on the investigation, application, and outcomes of service design tools and methods (process)

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_23 | Visual Interface Design

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Lara Schibelsky Godoy Piccolo	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Visual interfaces that are attractive, consistent and easy to understand are the typical bridges between successful digital solutions and their audience.

This module sheds light on the foundational knowledge for designing user visual interfaces. It addresses how we humans perceive visual interfaces, and how designers apply this knowledge to create user interfaces in creative and professional ways.

With a user-centered and inclusive perspective, the module covers the design process that includes modeling users' needs, information architecture, sketching and wireframes, design standards, usability, evaluation with users and design systems.

Qualification Objectives

Students who successfully pass this module are able to:

- Analyze users' needs by applying critical thinking to models such as users' stories, personas, empathy model, etc.
- Propose an Information Architecture (IA) that aligns with users' information needs, IA principles, and the users' expectations on the content organization and labels
- Formulate design ideas with sketches
- Design wireframes and high-fidelity prototypes
- Justify design decisions by referencing design principles, heuristics, accessibility guidelines and ethical considerations, such as avoiding dark patterns
- Evaluate the design with users to identify areas of improvement in usability and visual appeal
- Utilize design patterns, style guides and design systems to ensure consistency across the design

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_24 | Experience Design Project

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Martin Knobel	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

In this module, students explore the fundamentals of design through the lens of positive psychology in a group project. The module focuses on the interrelation between design and human behavior and teaches basic theories relating to psychological needs, positive experiences, emotions, perception, cognition, and effect. Students develop an understanding of human centered design through practical application. Students begin by investigating a given context and finish with an evaluated concept.

Qualification Objectives

Students who successfully pass this module are able to:

- Create an early stage design project in a group setting
- Conduct in-depth qualitative research in the form of narratives and observations
- Synthesize narratives derived from qualitative research, both individually and in a group session
- Ideate on the insights developed through synthesis, using storytelling as a tool
- Facilitate creative group workshops for ideation
- Examine different concepts and reflect on them based on insights
- Evaluate the final concept (plan, apply, and reflect)
- Present early stage prototypes to a group of professionals from diverse backgrounds
- Understand how to use design methods differently in order to apply them with a focus on positive experiences

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_25 | Design Methods II

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05; ID_06	
Module Coordinator:	Malith Prasanna Gunasekera	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module follows ID_06 Design Methods I - an introduction to design research.

In this module, students develop a more complex self-directed design research project through the application of multiple primary research methods and the utilization of secondary research/sources.

Through the use of given design methodologies (e.g., the double diamond), students define an area to investigate, gather data through aligned primary methods and synthesize contextually relevant insights and project next steps (e.g., design and/or research brief development).

In this module, students are expected to develop a critical understanding of the role of the design researcher, ethical practice, methods of data acquisition (e.g., validation and triangulation), analysis, etc. It is a practical module, so students are expected to demonstrate a body of work that includes experiments, documentation and reflection on practice throughout.

Qualification Objectives

Students who successfully pass this module are able to:

- Frame an area/topic to explore and investigate through the use of both primary methods (utilizing triangulation) and secondary sources
- Align/re-design primary methods to be contextually appropriate (Inc. rigorous research ethics) and apply to a self defined area/topic
- Analyze gathered qualitative and quantitative data through contextually relevant methods/approaches
- Synthesize information from multiple perspectives to generate area/topic relevant insights (Inc. project next steps, design and/or research brief development)
- Identify and utilize project relevant presentation and communication techniques

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_26 | Animation

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Ian Hutchinson	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module explores the application of animation and motion in both sequential and interactive media. Students must engage with the craft of animation both theoretically and practically to create compelling animations that communicate, emote or guide the user or viewer into a deeper understanding of the subject of the work. The module covers the context and history of animation, the underlying theories and principles of effective animation as well as practical tools and techniques needed to create engaging animated work.

Qualification Objectives

Students who successfully pass this module are able to:

- Utilize the fundamental properties of animation to communicate concepts, emotions, and messages
- Understand how to effectively analyze the use of motion in various media
- Develop ideas into compelling and emotive animations
- Understand and utilize various tools and/or software needed to create animation
- Apply both design and film language (composition, form, color, contrast, storytelling, framing, perspective, and editing) to motion and animated elements
- Create a finished work that utilizes the 12 principles of animation
- Communicate the core concept and the aim of the animated work
- Navigate and document the process of creating an animated work from start to finish
- Evaluate their own work

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_27 | Storytelling through Video

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Martin Knobel	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module provides students with an overview of methods and tools that can be utilized to create stories through compelling motion pictures. This includes storytelling and storyboarding, shots and framing, camera angles and movements, illumination, editing, aftereffects, and sound. Through this process, students need to meet the requirements of the production team and adopt changes accordingly. Additionally, students are required to show their work in public format and facilitate a reflection.

Qualification Objectives

Students who successfully pass this module are able to:

- Create a story through a motion picture using the full scope of methods and techniques necessary to create a compelling motion picture
- Collaborate with a production team and satisfy their needs during the process
- Implement and iterate ideas to the screen, including sound and visual effects, dramaturgy, plotting and story structure, and editing
- Evaluate your work and the work of others
- Present and discuss work in a public context

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_28 | Physical Interfaces II

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05; ID_13	
Module Coordinator:	Prof. Dr. Daniel Buzzo	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Building physical interfaces to interactive systems extends usefulness and usability beyond the screen, enabling a wide range of interactive experiences and allowing digital products to be created for a broad variety of use cases and contexts. Indicative areas of study in this module include exploring the current TEI and PI environment, microcontrollers and sensors, network connectivity of physical devices, and non-screen interactions. Students also learn physical interaction design paradigms and their history and application. Gain experience of some of the tools of physical interface-based prototyping - for hardware (e.g., Arduino, rPi, Beagle Bone) and software (e.g., p5, Javascript, C++, APIs, etc.) . Additional areas of indicative study include basic electronics, designing physical forms, accessibility, privacy, and standards-oriented design and development and networking and connectivity possibilities for extending functionalities (e.g., LoraWan, HTTP, OSC, Web of Things (WoT), etc.). The course also addresses aspects of design-based research for PI and TEI using lo-fi and hi-fi physical prototyping techniques, evaluation, and testing techniques. The course involves the use of common methodologies, processes and approaches such as Bodystorming, Wizard of Oz prototyping, Research Through Design approaches (RtD) and measures such as Technology Acceptance Model framework (TAM2).

Qualification Objectives

Students who successfully pass this module are able to:

- Build simple physical interfaces using common microcontrollers, sensors, actuators, and software systems and associated hardware using modern TEI (Tangible and Embedded Interaction) prototyping processes and techniques
- Assess the suitability of the target technologies for different use cases and environments (e.g., indoor, outdoor, mobile, domestic, industrial, etc.)
- Evaluate physical interface design, emphasizing usefulness and usability
- Recognize and apply interaction design and usability principles to a given context and specification
- Devise, design, assemble and implement a physical interface prototype for a specific use case or context, showing awareness of creative and technical good practices in system design and implementation (e.g., accessibility, security, privacy, usability, and usefulness)

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_29 | Artistic / Conceptual Project

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Martin Knobel	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

In this module, students explore the field of the artistic industry. The module focuses on the conception and implementation of a body of artistic works (e.g., exhibitions, a book, interventions, performances). Students aim to raise awareness and inspire their audience on a given topic in a lasting manner. Students explore diverse ways to execute and test aspects before planning, creating, and executing a final work. Afterward, students will reflect on their work in a meaningful way.

Qualification Objectives

Students who successfully pass this module are able to:

- Create and setup an artistic project in a group setting
- Facilitate group workshops with peers and an optional extended audience
- Analyze and transfer a topic into a creative outcome
- Execute a creative work for the purpose of presenting it to an audience
- Understand and apply techniques in an artistic development process in a creative field (e.g., sketching, prototyping, spatial design, etc.)
- Curate a set of artwork with an identifiable theme
- Combine design and theoretical reflections in the creative field
- Present creative work for a public audience

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

ID_30 | Artificial Intelligence in Design

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Daniel Buzzo	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Artificial intelligence (AI) and machine learning (ML) techniques are rapidly entering mainstream use in a wide variety of digital product contexts. This module explores AI and ML as design materials, investigating the potentials and challenges of AI techniques in an interaction design and creative context.

Indicative areas of study in this module include: An introduction to the current AI arena and machine learning environment, including techniques and domains such as Speech to Text (STT), Text to Speech (TTS), Computer Vision (CV), Machine Learning (ML) applications of neural network types, Large Language Models, and applications and processes of large data sets. The course also considers issues associated with AI and machine learning regulatory frameworks and ethics. Additional indicative study areas include the creation and use of datasets (e.g., expert systems, recommender systems, computer vision, and machine learning), practical applications of ML and AI techniques approached from a design context, and the use of high-level tools in prototype scenarios and discussion of the creative and design opportunities and challenges of working with smart tools and processes.

Qualification Objectives

Students who successfully pass this module are able to:

- Describe the main categories and effects of ML and AI techniques and areas that are appropriate for their application
- Build a simple prototype using existing systems or tools that explores an aspect of ML or AI applied to a design problem
- Evaluate the challenges, issues, and potential opportunities in applying machine learning and big data-based tools to human-centered design problems
- Devise a research and design process for investigating and evaluating applications and opportunities for machine learning in a design context or product
- Understand and explain relevant issues associated with the use and deployment of AI techniques from a legal, ethical, regulatory, and usability perspective

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_03 | Business Intelligence and Analytics

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Christopher Bonau Schmidt	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Students who study this module learn how to make data-informed decisions in product and business development. Organizations have to make decisions with ever-increasing frequency and complexity. The decision-making process needs to be context-sensitive and grounded in data to increase the chances of achieving desired outcomes. While data should not solely dictate the direction of development, both quantitative and qualitative data points should be taken into account to transcend personal opinions and biases. Operationalized, this means an organization's decision-making culture is data-informed and context-aware through the use of a strong data foundation, defined metrics, performance indicators and hypothesis-driven experimentation.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify the key performance indicators relevant for a given product and/or business
- Understand the link between goal-setting and data in a data-informed organization
- Understand the trade-offs of data collection, storage and processing in an organization
- Formulate hypotheses and design experiments to enable their validation
- Identify which data sets are required for different types of analyses
- Use various methods and tools to gather and analyze data sets
- Derive actionable insights from data analyses to inform tactical and strategic decisions
- Communicate insights effectively with visualizations and a clear storyline
- Understand and reflect upon the ethical and legal implications of data collection and analysis

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_09 | Strategic Partnerships and Third-Party Integration

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Esin Ceren Ahiska	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module focuses on the value of strategic partnerships and third-party integrations and the process for managing these to achieve success. Third-party integrations are becoming essential to attract and retain customers. As users seek ways to avoid using many different applications, they look for services that can address all their needs. At the same time, companies lack the capacity or expertise to implement diverse functionalities independently and instead join forces with third-parties or strategic partners to implement their services and leverage the potential of ecosystems to support growth. Additionally, this module considers the economic, technological, ethical, and legal dimensions of third-party integrations.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify strong strategic partners
- Understand the economic, ethical and legal aspects relevant to integrations
- Understand the range of technical integrations that are available

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_11 | Consumer Psychology

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Eva-Maria Lindig	
Module Applicability:	B.A. Interaction Design	Compulsory elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module provides an overview about consumer psychology and consumer behavior. Consumer psychology examines why and how people buy, use, and sell products and services. All consumers are similar in that they have needs and wants, but they differ in their consumption patterns and consumption behaviors. Consumer psychologists try to find the underlying cognitive processes behind consumers' choices as well as how advertisements, marketing, and external cues can influence consumer behavior.

When developing new products and services, it is crucial to understand how consumers process information (e.g. to develop a convincing and successful homepage/landing page for your product), how habits are formed (e.g. to increase your number of recurring users), how to attract attention to your product and how to ensure that customers remember your brand.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the psychological processes behind consumer behavior and how consumers make decisions, particularly about the concepts of identity, learning, attention, motivation, emotion, attitudes, cognitive processes and decision-making
- Understand research and methods in the field of neuroscience and neuromarketing
- Apply the findings of consumer psychology in marketing and product development

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_15 | Economics

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Christopher Bonau Schmidt	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Economics is the science of studying our interactions and exchanges using a complex value system. In this module, students examine questions including: What is an economy? What are the elements? What are the current arguments and positions taken? What are “schools of thought” and why are they relevant for how businesses are built and run? Why are there conflicting perspectives on how value should be understood and exchanged? What are the implications for communities and society? How can economic theory be applied to various business models? The module is based on the understanding of foundational perspectives in theories of economics, while also focusing on applications in various fields of economic activity.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand which school of thought specific policies represent
- Evaluate the arguments for and against specific policy actions
- Predict the impact of policy actions
- Understand the different perspectives in growth theory
- Understand the characteristics of different market types
- Apply game theoretic arguments to predict outcomes

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_16 | How to Start a Startup

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Christopher Bonau-Schmidt	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Students who study this module cover the topics of founding a legal entity, the associated tax requirements and strategies and options for external financing, and ultimately assessing which course of action is most appropriate for any given set of circumstances. Being a founder and entrepreneur is often seen as a paradise that is easily achieved. This module debunks this myth and helps students understand the real work, in clear steps, that get them through assessing the correct direction to take and follow proven steps that have enabled CODE students to develop successful companies.

Qualification Objectives

Students who successfully pass this module are able to:

- Apply standard approaches to developing a startup
- Apply the options for legal structures and taxation impact
- Apply popular options for capital and fundraising options, where necessary
- Reflect on appropriate approaches and strategies for funding and scaling

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_18 | Data Science and AI for Product Managers

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Kavita Kapoor	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

The module provides product managers who are working or wish to work with data, big data, artificial intelligence and machine learning with a deep foundational knowledge. The need for product managers to understand the complexity, ethics and regulatory frameworks to deliver data driven or AI enhanced products is increasing exponentially with many experts predicting that the economic value of AI will be a magnitude larger than the internet that gave rise to the digital product management discipline. This module develops students to have a data-driven approach to creating new digital products.

Qualification Objectives

Students who successfully pass this module are able to :

- Define the data engineering and ML basics
- Evaluate data governance approaches
- Compare and contrast data collection approaches (using data sets, creating from scratch, web/mobile behavior tracking, dark patterns)
- Explain APIs
- Apply data platforms and tools
- Create data led products

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_19 | Entrepreneurial Excellence - Running Your Business

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Chris Bonau Schmidt	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

The module for Entrepreneurial Excellence provides the best practices and theories for running businesses through the first years of growth after the legal founding process. The module explores the crucial elements and strategies commonly used to establish the foundation for businesses, including financial management, marketing, and team building. It provides opportunities to learn from successful entrepreneurs and industry experts, and covers the experiences and insights on what it takes to build a thriving business. This module prepares students for the substantial investment that will be made in growing CODE projects once funded and founded, preparing them for the fight for survival, and providing a space to share challenges, doubts, achievements, and learnings.

Qualification Objectives

Students who successfully pass this module are able to :

- Apply advanced brand building, marketing, and sales strategies
- Create a strong network, build a customer base, grow customer expectations, provide customer support and satisfaction, including suppliers
- Apply leadership fundamentals, including self-management, while building and managing winning teams which fulfill all legal requirements, and building an advisory board and manage the relationships with partners and investors
- Create a robust strategic plan, driving innovation and product development while analyzing market trends and capitalizing on opportunities while also managing risk
- Create and apply sound financial planning, bookkeeping, accounting, budgeting, and cash management disciplines, including the processes procurement, inventory, logistics, supply chain, export and import regulations
- Apply management principles in building physical assets and infrastructure, IT and technology, and compliance with legal, regulatory, tax matters, and building intangible assets such as intellectual property and trademarks

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_20 | Product Management Speciality

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florian Grote	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Product Management is a broad field of practice that is constantly evolving in new directions. Technological and methodological innovations require product managers to adapt quickly and explore new best practices on their own. In this module, students define a specialty topic and explore suitable learning resources on their own, with guidance from the PM faculty. Students chart a path toward the application of the knowledge they gain and evaluate the methods they used by reflecting on the experience they have gained. Students create outcomes in the forms of iterations on methods or pathways to product innovations.

Qualification Objectives

Students who successfully pass this module are able to:

- Analyze a domain of interest in the field of Product Management
- Evaluate appropriate learning resources in a self-directed manner
- Create innovative outcomes by implementing new methods

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_21 | Communication and Stakeholder Management

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Swantje Quoos	
Module Applicability:	B.A. Interaction Design	Compulsory Elective
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Elective

Contents

Students who study this module learn about communication and stakeholder management within product development. Both are key in any type of product development. From defining a strategy to implementing it with a team, communication with stakeholders, team members, executives, investors, partners, etc. needs to be clear and efficient to drive innovation processes. This also includes leading discussions, negotiations and different difficult conversations to prevent and solve conflicts. Students learn to identify, prioritize and manage different groups of stakeholders based on a clear approach. Ideas have to be conveyed in appealing ways in a variety of presentation and pitch formats to win support within the team and from external stakeholders. This entails self-reflection on one's own verbal and non-verbal communication style.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand and analyze how to manage and communicate with stakeholders effectively
- Understand concepts to negotiate with different types of partners
- Apply approaches to hold difficult conversations with team members and stakeholders
- Create presentations to inform different audiences about ideas and products, from potential users to stakeholders, investors, and the general public
- Create stories to embed storytelling into their internal and public communication
- Evaluate their own communication style

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_22 | Product Discovery

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Swantje Quoos	
Module Applicability:	B.A. Interaction Design	Compulsory Elective
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Elective

Contents

Overall, this module helps students to develop a basic understanding of the product discovery process and equips them with practical skills to navigate through the early stages of product development. It provides an overview of the product discovery process based on the Double Diamond to define a problem worth solving, identify user needs, understand the market, generate ideas, and validate prototypes to develop a Minimum Viable Product (MVP). Starting with a clearly defined problem or opportunity, students learn how to design a product with a measurable impact based on hands-on group work activities. As part of the discovery process, students learn how to utilize methods for Customer Discovery, Market Research, Ideation, Prototyping, and the evaluation of product ideas.

Qualification Objectives

Students who successfully pass this module are able to:

- Analyze different external factors to understand the market that influences a business
- Apply user research methods to identify user needs and generate user insights
- Apply creativity techniques to generate a wide range of ideas to solve a problem
- Create prototypes and user tests to validate concepts based on a hypothesis
- Evaluate solutions based on criteria such as desirability, feasibility, viability, and sustainability

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_23 | Product Marketing and Sales

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Roland Fassauer	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Businesses need customers and the ability to generate revenue from them. Marketing is the investment into reaching customers, building brand awareness and loyalty. Sales is the process of monetizing a product or service and ensuring exceptional customer experience.

Marketing and Sales need to work in tandem to unlock the growth potential of a product operation. In this module, students acquire in-depth knowledge about important marketing instruments in the internet/mobile and AI age for B2B and B2C sales processes.

Whether the product serves B2B or B2C markets, effective sales requires an understanding of relationship building and excellence in customer experience over the entire lifecycle of the relationship. Students explore successful techniques and strategies that ensure success at each stage of the lifecycle of the sales relationship: from initial awareness of need, solution exploration, the product choice and 1st moment of truth, closing the deal, product/service experience, post-sales experience, and achieving the positive referral to others. This module covers different ways of building and managing sales funnels from a traditional top-down model to product-led growth models and provides techniques to negotiate and close deals.

Qualification Objectives

Students who successfully pass this module are able to :

- Understand the essential concepts of marketing and sales, growth marketing and the customer lifecycle
- Understand consumer behavior as it relates to product marketing initiatives and marketing strategies for B2B and B2C sales processes
- Apply online marketing instruments, including search engine optimization (SEO), search engine advertising (SEA), social media marketing, and affiliate marketing, to create effective marketing campaigns
- Analyze key performance indicators (KPIs) to control the success of digital marketing campaigns, conduct A/B tests, and use statistical tools to ensure quality of results
- Create effective sales techniques to negotiate and close deals and managing sales funnels
- Create exceptional customer experiences, drive brand loyalty and enable viral growth

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_24 | Agile Ways of Working

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florian Grote	
Module Applicability:	B.A. Interaction Design	Compulsory Elective
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Compulsory Elective

Contents

Agile working cultures are enabling organizations of all types and in all industries to drive successful product development, innovation and digitalization initiatives. In this module, students gain practical experience in agile methodologies of project management. To enable successful application practices, they develop a deep understanding of the principles and values that underlie agile frameworks, such as Kanban and SCRUM. They learn to collaborate using these frameworks within self-organizing teams, collect and prioritize requirements, and manage the flow of work to deliver value to customers and stakeholders.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand how agile values and principles relate to their practice
- Analyze situations in a team environment and evaluate scenarios for applying agile methods
- Apply agile methods in a team environment
- Analyze customer and stakeholder requirements and discuss them in a team environment
- Evaluate and apply fitting prioritization methods

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_25 | Product Strategy and Decision Making

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florian Grote	
Module Applicability:	B.A. Interaction Design	Compulsory Elective
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Elective

Contents

Successful product development is based on integrating excellence into technology and design and implementing a clear strategy that takes the idea from concept to marketable product. Products have different goals, serving business requirements but also considering their social and ecological impact. Students learn to connect product goals with practical decision-making methods, enabling them to align a team on a focused implementation effort.

Qualification Objectives

Students who successfully pass this module are able to :

- Understand the impact of different strategic approaches on product development
- Analyze strategic market opportunities and the resources available and evaluate potentials for new product development
- Create strategic scenarios based on best practices and develop the respective positioning of their product
- Evaluate decision-making methods and apply the most fitting approaches based on the organizational setup
- Create decisions based on available data and stakeholder input and provide projections for their success
- Apply goal systems matching product vision and positioning
- Apply accountability for economic, social, and ecological impacts

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_26 | Business and Financial Models

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	50 hrs.	Frequency:	Annually
Self-study:	250 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Chris Bonau Schmidt	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module teaches the essentials of financially sustainable digital businesses: business model design, business planning, financial reporting and controlling. The business model segment focuses on how to construct, test, track, and improve a business model. When founding and building a company, it is not enough to have a great product. Every great product also needs a business model to allow the company to grow and innovate. Even in an early startup phase, it is important to think about business models that are replicable and scalable. Such business models are the key to successful and profitable products. Strategies to achieve sustainable growth based on a process of relationship growth with customers and stakeholders are explored.

The finance and controlling segment focuses on the valuable discipline of team-based business and financial planning. This module looks at the fundamentals of budgeting and planning, and the intersection with corporate strategy. Students acquire critical thinking and analysis skills of the financial statements of the startup and the large enterprise. Techniques for price setting and management are essential levers to achieving profitability. The basics of and tools for bookkeeping and tax reporting are presented in order to ensure compliance with regulatory requirements. The module explores the ethical implications of business models and managing financial resources, how they impact stakeholders, and techniques used to protect against unethical behaviors.

Qualification Objectives

Students who successfully pass this module are able to :

- Analyze the inner workings of successful business models and financial plans
- Synthesize new business models, pricing strategies, and financial plans
- Evaluate the effectiveness of their business models while iterating and optimizing
- Understand the basic requirements for bookkeeping and tax reporting
- Create and evaluate sustainable financial plans and analyze financial statements
- Evaluate ethical implications of business models and managing financial resources

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_27 | Teamwork and Collaboration

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Kavita Kapoor	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Compulsory elective

Contents

In this module, students learn about the importance of teamwork and collaboration and can practice these skills through their project work experiences. Good teamwork skills are essential in any work environment, and various factors contribute to being a good team member. Students demonstrate the necessary skills for successful and effective collaboration through working with international and interdisciplinary team members. They also gain an understanding of essential principles such as team development, feedback, communication, conflict management, and intercultural issues.

Students learn about effective teamwork and collaboration tools and discuss how they have applied and developed them. These tools include mindsets, team development stages, feedback, communication, conflict management, and intercultural awareness.

To complete this module, students must apply the skills they started to learn during the Orientation Semester to at least one project or in a work experience context.

Qualification Objectives

Students who successfully pass this module are able to:

- Analyze the differences between growth and fixed mindsets
- Create effective communication structures to promote team success
- Evaluate challenging conversations with team members and stakeholders
- Evaluate the various stages of team development and strategies to progress through them
- Evaluate the impact of cultural differences on team dynamics and interactions
- Understand the principles of giving and receiving feedback constructively
- Understand and evaluate the different steps of collaboration throughout the project lifecycle
- Evaluate personal communication styles and their effectiveness in team settings

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

PM_28 | Leadership

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	40 hrs.	Frequency:	Annually
Self-study:	260 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Birte Loeckel	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Compulsory Elective

Contents

The term Leadership is omnipresent. But what does it really mean, how do you interpret it, and what's your personal style? This module enables students to experience a very personal journey to find their leadership style.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand various leadership styles and their impact on individuals and teams
- Analyze their personal leadership journey, benchmarks to be aware of, and their own affinities in leadership
- Evaluate different options to form and express critical opinions about different angles of leadership, such as feminist approach, cultural differences or leadership of introverts
- Apply methods to demonstrate empathy, take different point of views and express them in a constructive way
- Apply methods to handle hard and uncomfortable conversations, reflect on them and foresee possible outcomes

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_01 | Software Development Basics

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Fabio Fracassi	
Module Applicability:	B.A. Interaction Design	Compulsory elective
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Elective

Contents

Software development is the process of building a software application, a key element in the larger software engineering process. A wide range of topics are covered in this module, which together allow a student to solve problems and practice using computer programming. The basic concepts of computer programming are covered here as well as the configuration and use of a computer for software development, including the command line interface and integrated development environment. Key elements of the practice of software development are also covered, including the process of iterative development, the use of version control, debugging, and the documentation process.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand and use the basic features of programming languages
- Use the command-line interface (CLI)
- Apply basic version control
- Use integrated development environments (IDE)
- Understand iterative development
- Debug and troubleshoot computer programs

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_02 | Algorithms and Data Structures

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florencia Noriega	
Module Applicability:	B.A. Interaction Design	Compulsory elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Mandatory

Contents

A number of basic algorithms and data structures are at the core of nearly every program. Inspecting algorithms and understanding their efficiency using techniques such as asymptomatic analysis is key to the assessment of algorithms. Similarly, learning about common data structures and understanding the advantages and disadvantages is fundamental for students to be able to make informed decisions about what data structures to use and how to use them effectively.

In this module, students learn about the analysis of algorithms, algorithm time complexity, and searching and sorting algorithms. Important data structures such as linked lists, arrays, hash tables, trees, and graphs are also part of this module.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand and apply time complexity theory and asymptotic notation to analyze algorithms
- Analyze searching and sorting algorithms
- Understand data structures, their operations, and time complexities
- Understand basic data structures and how they can be combined to build abstract data structures
- Differentiate the advantages and limitations of the data structures and their applications

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_03 | Concepts of Programming Languages

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Fabio Fracassi	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Mandatory

Contents

There is a wide variety of programming languages, but these languages are usually based on common concepts. Understanding these concepts makes it possible to quickly understand and learn new languages and to make informed choices about the language(s) to use in a project.

This module introduces the concepts found in programming languages and their implementation into compiler or interpreter operations. Students develop an understanding of those concepts and the similarities and differences between languages. This is supplemented by knowledge of compilers/interpreters and their inner workings.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand general concepts in programming languages such as typing, object-oriented programming, functional programming, and memory management
- Identify variations of programming concepts in different programming languages
- Apply programming concepts in practice
- Select a programming language based on the desired concepts
- Understand compiler operations such as lexical analysis, parsing, semantic analysis, code optimization and code generation

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_04 | Network Programming

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Fabio Fracassi	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Network programming is about creating software which communicates across a computer network. Computer operating systems provide access to the networks they are connected to via low-level APIs, such as sockets, and many programming languages and libraries provide implementations of common network layer protocols such as TCP and UDP, or application layer protocols such as HTTP, IMAP or FTP.

In this module, students investigate and answer questions such as: How does the choice of protocol affect the way an engineer architects and builds their software? Which network and software choices are “best practice” for transferring large amounts of data that need to arrive perfectly intact, or for real-time streaming of a multi-person video call, or for sending information from an array of IoT devices? What are the pros and cons of various types of network protocols? How does a software engineer design for a network connection that may be unreliable? Which protocols are useful for software that is running on a device not connected to the internet?

Qualification Objectives

Students who successfully pass this module are able to:

- Understand usage of common network protocols, their advantages and limitations
- Design and implement software using low-level network connections
- Evaluate choices of network protocols used and their interaction with software applications
- Explore the foundational technologies of the internet and how applications interact with them

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_05 | Relational Databases

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Fatma Meawad	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Compulsory elective

Contents

The need for storing, updating, managing and searching data in a machine-aggregable and comparable format while being accessed by multiple users simultaneously was observed early on in informatics and still remains a major challenge.

Starting with a discussion on how to define a data model, this module covers the basics of operating relational database systems, both the theoretical foundations with relational algebra as well as practical usages such as creating tables, storing data in normalized formats and manipulating information. Furthermore, students learn about data handling and manipulation techniques like aggregation, indexing, joining and handling huge amounts of data, as well as accessing data through an application by way of appropriate frameworks, e.g., using Object-Relationship Mappings (ORM). Advanced database objects like user defined functions, triggers or stored procedures are discussed. The motivation for serializing operations is discussed as well as the implementation of transactions and the option of transaction failure and error handling. The course concludes with an overview of state-of-the-art developments.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the fundamental concepts of relational databases, such as tables, rows, columns, primary keys, foreign keys, and relationships
- Understand how to design a relational database schema that is normalized and efficient
- Understanding the use of SQL for basic and advanced data manipulation
- Understand how to tune and optimize database performance using indexing and query optimization
- Understand database transactions and the ACID properties
- Understand the challenges of scaling relational databases
- Understand DB Access Modules and OR mapping frameworks
- Apply the knowledge of relational databases, its core concept and the use of SQL in a practical project

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_06 | NoSQL Databases

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Fatma Meawad	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Compulsory elective

Contents

Building a new application frequently requires the implementation of an operational data store (ODS) in an early stage of design and development. Usually, this requires flexible database schemas and simple development. Further along in development, elastic scaling, accommodating a fast-growing dataset, and minimizing the use of system resources may play a significant role. NoSQL databases can solve these issues, especially for unstructured or semi-structured data or in a state of development where schema and requirements are still unclear. Furthermore, understanding NoSQL databases includes understanding different types, such as document databases, key-value databases, or graph databases. In this module, students learn how to configure and adapt a data model for NoSQL databases. They learn how to optimize efficiency and performance of the databases and how to access them while programming, including through the usage of source code and frameworks.

Qualification Objectives

Students who successfully pass this module are able to:

- Define and adapt data models to meet business/project needs
- Understand the advantages and disadvantages of NoSQL compared to relational databases
- Understand the concepts, characteristics, and significance of NoSQL
- Understand the limitations of NoSQL
- Understand the advantages and disadvantages of different types of NoSQL databases
- Utilize a query or full-text search function in the respective NoSQL database
- Optimize the respective data structure for huge amounts of data, performance, and efficiency
- Interact with a NoSQL database through source code including direct access through plain database objects as well as indirect access through a programming framework
- Understand and apply the advanced concepts of replication, distribution, sharding, and resilience in a NoSQL database

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_07 | Technical Documentation

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Mandatory

Contents

Software engineers often need to communicate about technical topics in writing, and the ability to do so well is an essential skill in the professional world. Technical documentation can cover such diverse topics as installation instructions, reference documentation, and conceptual system descriptions. In addition, today's documentation covers multiple formats and methods of dissemination, among them blog posts, wiki pages, emails, and traditional page-based documents. Finally, diagrams are an integral part of many documents, so it helps to be able to convey information well using diagrams.

In this module, students will learn to write technical documentation that is understandable and well-structured. The focus is on being able to transport information in written form in a clear and precise way.

Qualification Objectives:

Students who successfully pass this module are able to:

- Write documentation that is clear, well-structured, concise, correct, precise, and reader-focused
- Identify different document types and select appropriate types to write
- Identify an appropriate audience for a document and write to that audience
- Structure text according to appropriate sub topics
- Write documents in an iterative way
- Create appropriate diagrams for inclusion in documents
- Identify information that is best conveyed using diagrams
- Select appropriate diagram types and draw diagrams that have a clear layout and go to an appropriate level of detail

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_08 | Clean Code

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Fatma Meawad	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Mandatory

Contents

Clean code is code that can be adapted to changing requirements. The alternative is code that grows more and more disorganized as it is changed over time, leading to slower and slower development. This module introduces clean code principles such as well-structured functions, classes, and modules. It also covers methods for iteratively achieving a high code quality. This includes the ability to recognize potential quality issues (“code smells”) and leverage refactoring to improve quality.

Basic knowledge of automated testing is a prerequisite for this module, so completing *SE_10 Automated Software Testing* either concurrently with or before this module is strongly recommended.

Qualification Objectives

Students who successfully pass this module are able to:

- Recognize both high-quality code and potential quality issues (‘code smells’)
- Understand and practically apply code structuring principles
- Improve code quality by refactoring, which also includes a theoretical understanding of the refactoring process
- Apply advanced version control

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_09 | Cyber Security

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Peter Ruppel	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Mandatory

Contents

Cyber Security is a specialized field that focuses on ensuring the confidentiality, integrity, and availability of software systems and data. Cyber Security encompasses various methods, practices, and tools to protect software systems and data from cyber threats, such as hacking, data breaches, and malware attacks. For Software Engineers, Cyber Security involves understanding and integrating security principles throughout the entire software development lifecycle.

Students who study this module develop an understanding of the core methods of Cyber Security, and apply them in a practical context.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand different dimensions of Cyber Security
- Perform a threat model analysis
- Understand security threats and their mitigations for software systems and data on different layers, for example, physical threats, network-related threats, transport-related threats, or application-layer threats
- Understand and apply methods and tools used for authentication, authorization, validation, encryption, signing, and key management
- Understand and apply methods, tools, and best practices for securing web applications
- Understand and apply methods and tools used for securing the development lifecycle and operation of software applications

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_10 | Automated Software Testing

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Mandatory

Contents

Automated testing of software has grown in importance in the last two decades, mainly because refactoring and continuous deployment are next to impossible without well-written automated tests. This module focuses on automated testing in its different forms, including unit testing, integration testing and system testing. It also covers the practical ability to write tests for a piece of software and to judge whether these tests are sufficient or not.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify and describe the available testing methods
- Choose appropriate testing methods for concrete projects
- Implement practically useful tests for concrete projects
- Reflect on the usefulness of automated testing in general and a specific set of tests in particular
- Understand the principles of test-driven development

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_14 | Artificial Intelligence Basics

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Frank Trollmann	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Artificial intelligence seeks to enable artificial systems to act autonomously and rationally. This includes equipping them with basic capabilities of human intelligence, such as planning their own actions, reasoning on the basis of known information, or learning from experience.

Students who study this module develop a basic understanding of the core methods of artificial intelligence. This includes the concept of rational agents, the basics of machine learning, the basics of automated reasoning, and the basics of decision-making using rule-based approaches, planning, and optimization.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the basic concepts and algorithms in machine learning, planning, optimization, and reasoning
- Decide when to use machine learning, planning, optimization, and reasoning
- Formulate a problem in a way that enables the application of standardized algorithms from machine learning, planning, optimization, and reasoning
- Apply their knowledge in a practical context in at least one of the areas above

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_15 | Machine Learning

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Frank Trollmann	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Students who study this module learn advanced techniques in machine learning. In order to achieve state-of-the-art results in machine learning, the engineer must apply advanced methods to find the right model and fine-tune it. To understand the results, it is useful to visualize the model itself but also the model's focus on input data, for example, understanding which part of an image was relevant to decide for a specific classification.

In this module, students prove their proficiency in the subject by doing a deep dive into a machine learning problem. Students focus on applying the respective methods, tools, and knowledge to the machine learning question within their project. Students show that they are able to make an educated decision on machine learning models and their configuration (e.g., layers and architectures of a neural network). They prove that they understand how the selected machine learning approach works and can support this by e.g., creating a visualization of their learning outcomes. Furthermore, their project demonstrates the student's ability to select and interpret appropriate evaluation-metrics, handle complex or unbalanced data, and use programming approaches that improve the performance of their chosen model.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the meta-learning process
- Implement deep dives on approaches including, but not limited to, Neural Networks for time series analysis or image classificationDecision tree learning (classification trees, regression trees)
- Understand advanced training methods
- Interpret and present evaluation metrics

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_19 | Web Technologies Basics

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Samuel Boguslawski	
Module Applicability:	B.A. Interaction Design	Compulsory elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Websites are an essential means of communication in the world we live in. Since the inception of the Web, its uses have stretched into nearly every corner of daily life, and its capabilities and architecture have become more refined and complex.

This is a broad module covering a general understanding of how a website works, what a web server is, how to dynamically generate and serve content, how a website can be made accessible via the internet, the use of HTTP, how it can be viewed by a user on a browser and what the DOM is, and how a website can receive input from the user. Students build an understanding of what choices they are free to make, e.g., choice of backend language. Students also learn to understand what the roles of HTML, CSS, and JavaScript are for a website and how they interact. Common architectures for websites, for example MVC or JAMStack are examined here as well.

Qualification Objectives

Students who successfully pass this module are able to:

- Determine when and how to utilize web technologies as a software solution
- Create simple websites with responsive layouts
- Differentiate between the role of the web client and web server
- Create dynamic web backend applications
- Apply both client-side and server-side rendering for dynamically changing content
- Handle long-lived state and dynamically changing data on the backend
- Deploy and securely run dynamic web backends in a web server environment

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_23 | Continuous Delivery and Operations

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Adam Roe	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Software engineering processes have evolved from the days of long release cycles, slow feedback, and a perpetual high tension between the teams responsible for developing software and those responsible for operating it. Continuous Integration, Delivery and Deployment are a set of practices which enable software developers to get rapid feedback on their progress while ensuring that the software is always ready to be released, and in doing so scale the engineering work of a team. These processes rely on many techniques including build automation, automated software testing, certain version control strategies, automated deployment pipelines, and monitoring of production software. Collectively known as “CI/CD”, this approach has dramatically improved the way software teams work together, changed the shape of organizations, and improved the reliability of software systems at the same time. CI/CD relies on many elements, both technical and cultural - the latter often being referred to as DevOps.

Students who study this module explore both the how and the why of this evolution. Furthermore, as CI/CD and DevOps become standard in the software engineering process, methodologies keep evolving, with related practices emerging and gaining traction. Such evolving best practices are covered in this module as well.

Qualification Objectives

Students who successfully pass this module are able to:

- Design and implement a state-of-the-art software deployment pipeline
- Apply continuous integration and delivery
- Participate in the team culture and dynamics required to successfully use CI/CD
- Understand continuous deployment, its benefits and difficulties

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_24 | Distributed and Parallel Computing

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Fabio Fracassi	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Scaling and growth of computational power depends on parallelization and concurrency. Even entry-level consumer computers are equipped with multicore machines, and any software which does not make use of the hardware's capabilities is considered substandard. The associated non-deterministic scheduling has, however, brought new challenges into the process of software engineering, requiring an understanding of locking and synchronization. When network or protocol latencies are added on top of parallelization, a profound understanding of the system is required for efficient calculations.

This module covers both standard and emerging best-practices for parallelization and synchronization. Students examine the design and implementation of distributed computing systems and analyze the limits of a system in this context.

Qualification Objectives

Students who successfully pass this module are able to:

- Design and implement distributed and parallel computing systems
- Understand and use synchronization primitives
- Understand and use typical parallelization design patterns
- Identify parts of a problem which can be parallelized and implement the necessary algorithm
- Understand which types of algorithms and problems are suited to parallelization
- Understand the physical and algorithmic limits of parallel processing

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_28 | Linear Algebra

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florencia Noriega	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Linear algebra is at the core of many software engineering applications, including machine learning, 3D rendering, and image processing. Learning linear algebra notation operations are essential for understanding how math translates into meaning.

Students in this module learn systems of equations, vectors, matrices, and their relevant operations. Linear transformations and vector spaces are also examined.

Qualification Objectives

Students who successfully pass this module are able to:

- Solve systems of equations
- Operate vectors and matrices
- Understand and use determinants and the inverse matrix
- Understand the concepts of linear independence and span
- Understand the concepts of basis and dimension
- Understand the concepts of vector space and subspace
- Understand and use linear transformations
- Understand and use eigenvalues and eigenvectors

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_29 | Multivariate Calculus

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florencia Noriega	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module covers differentiation and integration with one variable, differentiation of multivariate function and applications.

Qualification Objectives

Students who successfully pass this module are able to:

- Apply functions, (e.g. polynomials, trigonometric functions, and power laws)
- Apply limits
- Apply differentiation with one variable (e.g. power, product, and chain rules)
- Apply integration with one variable
- Understand the fundamental theorem of calculus
- Apply multivariate calculus (e.g. partial differentiation, directional derivatives, calculation and geometric interpretation of vectors and matrices in multivariate calculus - gradient, Jacobian, Hessian, and chain rule for multivariate functions)
- Implement applications of multivariate calculus (e.g. Taylor series approximation, linearization, and optimization and constrained optimization

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_30 | Probability and Statistics

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Adam Roe	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Probability and statistics constitute a powerful framework that helps us understand, analyze, and visualize random processes. Probability helps us quantify uncertainty and thus make informed decisions about what is likely to happen based on the information we have. Statistics help us describe random phenomena and make inferences from data.

Students are introduced to the basic theory and practice of the discipline. This includes both descriptive and inferential statistics on simple datasets, as well as the foundations of probability theory as well as various interpretations of probability.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the fundamentals of probability theory and be able to apply the theory in practice, such as calculating the expected values of an event or the number of permutations and combinations
- Distinguish between frequentist and bayesian interpretations of probability in theory and in practice
- Apply the basic techniques of descriptive statistics to simple datasets, including visualization techniques, measures of central tendency and variability, and using common parametric distributions
- Apply the basic techniques of inferential statistics to simple datasets, including correlation, linear regression, population sampling, and null hypothesis testing
- Use statistical analysis software for basic techniques of descriptive and inferential statistics with a simple dataset
- Interpret the statistical analysis of real-world datasets
- Understand the deep connection between probability and statistics

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_31 | Applied Scientific Research

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florencia Noriega	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Scientific research is at the core of our modern societies. In this module, students acquire practical experience in a scientific research field of their choice.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand a research field by actively reading scientific literature
- Formulate a research question
- Design and execute a methodology to address the research question
- Discuss question and findings in the context of the existing literature

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_35 | Software Modeling and Design Patterns

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05; SE_08; SE_10	
Module Coordinator:	Dr. Fatma Meawad	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Software systems tend toward chaos over time. It happens so often that researchers identified it as a pattern: “the big ball of mud”. To avoid this anti-pattern, software engineers are expected to have a strong sense of software design and to develop structure into their systems on a regular basis. This module introduces the common principles, patterns, and practices used to design software systems. There are several learning opportunities in the field to solve problems at different levels of software architecture, from the organization of code within a single module, to the organization of multiple modules into a larger system. Students learn how to make design decisions based on the requirements of a problem and the trade-offs of different design options. Students also learn to balance effort and value in the design process by using "good enough" agile modeling artifacts for communicating and documenting their solutions.

This module directly builds upon the content of SE_08 Clean Code, and therefore, SE_08 and SE_10 are prerequisites for SE_35.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the common software design principles and their use in developing maintainable software structures
- Differentiate between various software design patterns and their context of use
- Understand commonly used architecture styles and the trade-offs in their quality attributes
- Identify potential problems in an existing software design (”design smells”) and propose alternatives
- Understand the different types of diagrams and techniques used in modeling software
- Communicate the design decisions and the structure of a software project with appropriate modeling artifacts
- Understand the industry practices in documenting and evaluating software architecture
- Apply the knowledge of software design principles and modeling in a practical project

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_37 | Optimization in Artificial Intelligence

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Frank Trollmann	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Optimization is a search technique that assigns values to a set of parameters such that they optimize the output of a given function. Examples span from microeconomics (e.g., maximizing the utility of a fixed budget or maximizing the revenue of a business) to control engineering (e.g., model predictive control). The task of engineering an optimization system requires an appropriate formalization of the optimization problem reflecting domain constraints, optimization goals and quality requirements. Solving the optimization problem requires the selection, configuration and evaluation of an appropriate algorithm.

In this module, students prove their optimization proficiency by doing a deep dive into a specific and advanced optimization problem. In the process, students develop a comprehensive understanding of optimization problems, constraints and quality requirements, optimization algorithms, and their configuration. The application of optimization in the context of this deep dive shows the ability to apply this understanding in a complex optimization problem.

Qualification Objectives

Students who successfully pass this module are able to:

- Formulate and analyze optimization problems
- Formulate optimization goals, side-constraints, and quality requirements
- Select, configure, and evaluate optimization algorithms

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_38 | Planning in Artificial Intelligence

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Frank Trollmann	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Planning is a search technique that identifies a sequence of actions that lead from a start state to a goal state. Examples are calculating a route in a street graph, selecting moves for a game like chess, or scheduling production processes in a factory. The task of engineering a planning system requires an appropriate formalization of the planning problem reflecting the domain constraints, actions and goals. Solving the planning problem requires the selection, configuration and evaluation of an appropriate algorithm.

In this module, students prove their planning proficiency by doing a deep dive into a specific and advanced planning problem. In the process, students develop a deep understanding of planning problems, constraints, and goal formulations, as well as planning algorithms and planning heuristics. The application of planning in the context of this deep dive shows the ability to apply this understanding to a complex planning problem.

Qualification Objectives

Students who successfully pass this module are able to:

- Formulate and analyze planning problems
- Formulate planning constraints and goal functions
- Select, configure, and evaluate planning algorithms

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_39 | Publishing a Research Paper

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Frank Trollmann	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Publishing a research paper is a challenging task requiring specific skills. This includes knowing how to write a proper paper, follow documentation standards, follow good scientific practices, understand peer reviews, and write a rebuttal. Students in this module learn how to go through this process for the first time. Students also explore how to select the right journal, understand their specific requirements, what a peer review is, and how to manage the actual publication process.

As a precondition for the module, students should have research results they intend to publish or a project setup that will produce such results.

Qualification Objectives

Students who successfully pass this module are able to:

- Select the right journal or conference for their paper
- Write a paper following good scientific practices and the conference requirements
- Understand and participate in a submission process for a peer-reviewed publication venue
- Reflect and refine their paper based on peer feedback

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_40 | Essential Mathematical Methods

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Adam Roe	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Mathematics is essential for programming, digital products, technology, and engineering. In this module, students build the framework of mathematics for further study and real-world projects. The module covers a variety of mathematical methods from fields including linear algebra, calculus, set theory, and graph theory, which together provide a foundation for advanced mathematics and a toolkit for use in real-world applications.

Qualification Objectives

Students who successfully pass this module are able to:

- Apply essential mathematical skills including exponents, functions, polynomials, logarithms, systems of equations, inequalities, lines, and planes
- Manipulate vector and matrix and understand their geometry
- Apply limits, derivatives, integrals, Taylor series, and optimization
- Understand the fundamental principles of logic and its applications
- Understand elementary set and graph theory and their application and relation
- Apply change of base in numeral systems as well as modular arithmetic

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_41 | Digital Fabrication

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Compulsory Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Digital fabrication is the creation of physical items from software-based three-dimensional (3D) models. It is typically used for low-volume (or one-off) production. Examples for tools used for the actual production are 3D printers, laser cutters, and computer numerical control (CNC) mills. All of these production methods have a fairly low setup cost and low turnaround time, making them suitable for use in prototyping contexts.

This is a broad overview module. Students learn about relevant tools and methods of 3D software modeling and options available for digital fabrication based on those models.

Qualification Objectives

Students who successfully complete this module are able to:

- Produce physical objects using one-off fabrication techniques
- Understand typical fabrication processes, choose techniques based on project goals, and practically fabricate objects
- Understand computer-aided design (CAD) concepts and create models using CAD software
- Understand broad overview of computer-aided manufacturing (CAM) methods and prepare 3D models for the fabrication process
- Understand available materials, their properties, and their applications as well as the ability to choose materials based on project goals

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_42 | Data Science Basics

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Pass/Fail

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florencia Nriega	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Data Science seeks to transform data into knowledge by combining computer power, critical thinking and domain knowledge. Students who study this module learn how to use state of the art techniques to explore data using statistics and visualizations. Through the use of real world case studies this module discusses how to draw and assess conclusions derived from data.

Qualification Objectives

Students who successfully pass this module are able to:

- Apply state of the art technologies to investigate simple datasets
- Distinguish the attributes of different data types, in particular categorical, ordinal, continuous
- Use appropriate visualizations to explore datasets, in particular bar plots, line plots, scatter plots and histograms
- Use descriptive statistics to get familiarized with data
- Understand how to evaluate an argument based on empirical evidence

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_43 | Data Science

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florencia Noriega	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module is focused on applying data analysis skills to extract knowledge from complex datasets. Students doing this module learn how to perform data acquisition, wrangle datasets and explore them using appropriate methods. Students should be able to communicate their results in a scientific way.

Qualification Objectives

Students who successfully pass this module are able to:

- Formulate questions to investigate complex datasets and design a methodology to answer these questions
- Manipulate and clean data
- Understand data pipelines and their implications on the properties of the resulting dataset
- Design and execute methods to analyze data (choose adequate visualizations and apply concepts of statistics to describe trends in data)
- Analyze and evaluate data-driven results through critical discussion

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_44 | Embedded Development

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Embedded systems - computers that are a part of a larger device - play a huge role in today's world. In most cases, the computers used are microcontrollers: highly resource-constrained, low-power systems without an operating system. Developing for these systems is significantly different from development for larger systems, since much of the infrastructure that is generally taken for granted is not available.

In this module, students will learn to develop complex embedded systems on microcontrollers. Students are expected to apply this knowledge by contributing significantly to a complex embedded application.

Qualification Objectives

Students who pass this module are able to:

- Develop on resource-constrained low-power hardware
- Develop using a low-level programming language using cross-compilers and -debuggers
- Design appropriate software architectures for embedded systems
- Connect and control peripheral devices with hard real time constraints
- Select appropriate electronic and electrical components to use and integrate these components into the overall system
- Write maintainable embedded code

Learning Resources

Learning resources are announced in advance at the beginning of each semester

SE_45 | Web Frontend Technologies

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Samuel Boguslawski	
Module Applicability:	B.A. Interaction Design	Compulsory elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Web Frontend Technologies have become sophisticated and complex in recent years, allowing for new browser capabilities, a bustling ecosystem of tooling, new architecture patterns, and a new way of thinking about and building websites.

Students in this module learn about contemporary best practices in frontend web application development. The core of this module is a focus on building advanced websites in a secure, modern, and accessible fashion. This includes utilizing a stateful client or pushing the limits of computation in the browser by incorporating new technologies and developments.

Students are expected to apply this knowledge by contributing significantly to the engineering of a complex frontend web application.

Qualification Objectives

Students who successfully pass this module are able to:

- Build and deploy complex and stable frontend applications
- Identify, select and use the most appropriate frontend development tools, frameworks, and libraries
- Apply advanced JavaScript development concepts
- Apply modern frontend development patterns
- Create interactive and dynamically changing user interfaces, handling short and long-lived state client-side
- Build systems that consume HTTP APIs on the client-side and update state dynamically
- Write maintainable frontend code
- Design frontend architectures optimized for reliability, accessibility, speed, and security

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_46 | Web Backend Technologies

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Samuel Boguslawski	
Module Applicability:	B.A. Interaction Design	Compulsory elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Web backend development has grown into a mature field with proven best practices, a focus on designing software for horizontal scalability, and the ability to serve multiple clients via APIs in a secure, modern, and fast network interface. Various software design patterns are used in practice, often dependent upon server architecture. These patterns include monolithic applications, microservice architecture, and serverless architecture.

Students who study this module focus on the question of how to build software applications that are performant, secure, and scalable in a given context. They are also able to make informed decisions about the tech stack and general development approach.

Students are expected to apply this knowledge by contributing significantly to the engineering of a complex web backend application.

Qualification Objectives

Students who successfully pass this module are able to:

- Build and deploy complex and stable backend applications
- Choose and apply most suitable software and server architectures
- Identify, select, and use the most appropriate programming language, framework, and development tools
- Design and build a scalable API ready for multi-client consumption
- Identify and utilize the most appropriate methods of building scalable and stateful backends
- Write maintainable backend code
- Apply appropriate measures of authentication, authorization, and general web security
- Design backend architectures optimized for performance and horizontal and vertical scalability

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_47 | Mobile App Development

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Dr. Frank Trollmann	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module focuses on the development of mobile applications and common issues and frameworks associated with this activity. This includes the challenges resulting from varying devices, the technological difference between the prevalent platforms, and limited connectivity.

Students are expected to apply this knowledge by contributing significantly to the engineering of a complex mobile application.

Qualification Objectives

Students who successfully pass this module are able to:

- Design and implement software architectures for applications with native mobile frontends
- Identify, select, and use the most appropriate development tools, frameworks and libraries for mobile app development
- Understand the commonalities, differences and specific challenges of native and cross-platform development frameworks
- Create interactive and dynamically changing user interfaces
- Implement mobile apps that are able to deal with specific aspects of mobile devices, such as limited resources, sensor integration, and intermittent connectivity

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_48 | Cloud Computing

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Adam Roe	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Cloud computing is the practice of using computer infrastructure and services in a flexible manner, delivered over a network. This encompasses computation, storage, and dedicated services. The widespread availability of cloud computing has changed the shape of organizations, impacted software architecture, legislation, and changed the software development process itself.

Students in this module learn about what cloud computing is and how to use it. The module encompasses the use of typical services offered in a cloud and the ways in which cloud computing can be leveraged to help the software engineering process. Students also investigate pitfalls such as high cost, compliance issues, and vendor lock-in. Furthermore, students gain practical experience with tools and methods associated with cloud computing including programmable infrastructure, containerization and orchestration of containers, and serverless software.

Students are expected to apply this knowledge by contributing significantly to a cloud computing architecture.

Qualification Objectives

Students who successfully pass this module are able to:

- Design and implement a well-considered cloud architecture for software applications
- Assess the benefits and pitfalls of various engineering decisions inherent in the cloud
- Apply best practices for managing software in the the cloud and the cloud itself
- Distinguish between various cloud service models and select appropriately
- Adapt software applications as appropriate for the cloud architecture at hand

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_49 | Blockchain

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	270 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Peter Ruppel	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

The invention of Bitcoin in 2008 and the development of subsequent blockchains have revolutionized the way data can be stored, managed, and retrieved in a decentralized fashion by providing global consistent state information that is protected by a consensus among the participants of the network. On top of that, Web3 has emerged, which is based upon a novel set of protocols and crypto assets that facilitate various decentralized applications.

Crypto assets can be considered as exchangeable virtual assets that utilize cryptography and are shared via a distributed ledger. Within all crypto assets, the native cryptocurrencies have been a major driving force behind developments in the field for several years. At the same time, various token systems have emerged, comprising both fungible tokens (such as ERC20-based tokens) and non-fungible tokens, which can represent, for example, digital collectibles or domain names. Token systems were introduced as custom implementations of smart contracts. Their code is executed upon receipt of a transaction and smart contract accounts can store and modify local state and implement arbitrary computations. Other important aspects of Distributed Ledger Technologies (DLTs) are scaling solutions and state channels, wallet solutions for end users, the design of governance processes, as well as IT operations for Blockchains and DLTs.

Students are expected to apply this knowledge by contributing significantly to the engineering of a complex decentralized application.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand fundamentals of distributed ledger technologies (DLTs)
- Understand principles of consensus algorithms and DLT governance
- Understand cryptocurrencies and token systems
- Design and implement complex decentralized applications
- Understand scalability solutions, state channels, and side chains
- Understand digital wallets for DLTs
- Understand blockchain operations

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_51 | Software Engineering Specialty

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Software engineering is both a very broad domain and a domain of rapid change. New technologies evolve fast, others are niche topics only covered by some experts. Students in this module focus on finding a special SE topic, conduct research on appropriate learning resources, and explore the topic in depth. Furthermore, they learn the process of understanding the requirements derived from implementing their specialty topics and become familiar with the respective tools and methods related to this project. By applying these in the scope of a project, students learn to gain professional knowledge and application skills in a chosen topic in a self-directed manner.

It is possible to take multiple of the modules SE_51 to SE_56 in one semester, but they need to be taken in ascending order (SE_51 - SE_53 as well as SE_54 - SE_56) to avoid confusion. Further, the topics must not overlap, nor may the topic of a specialty module overlap with other modules' topics.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify a domain of interest
- Evaluate appropriate learning resources
- Demonstrate professional knowledge and application skills in the chosen topic
- Apply the learned skills in a practical or research project

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_52 | Software Engineering Specialty

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Software engineering is both a very broad domain and a domain of rapid change. New technologies evolve fast, others are niche topics only covered by some experts. Students in this module focus on finding a special SE topic, conduct research on appropriate learning resources, and explore the topic in depth. Furthermore, they learn the process of understanding the requirements derived from implementing their specialty topics and become familiar with the respective tools and methods related to this project. By applying these in the scope of a project, students learn to gain professional knowledge and application skills in a chosen topic in a self-directed manner.

It is possible to take multiple of the modules SE_51 to SE_56 in one semester, but they need to be taken in ascending order (SE_51 - SE_53 as well as SE_54 - SE_56) to avoid confusion. Further, the topics must not overlap, nor may the topic of a specialty module overlap with other modules' topics.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify a domain of interest
- Evaluate appropriate learning resources
- Demonstrate professional knowledge and application skills in the chosen topic
- Apply the learned skills in a practical or research project

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_53 | Software Engineering Specialty

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Software engineering is both a very broad domain and a domain of rapid change. New technologies evolve fast, others are niche topics only covered by some experts. Students in this module focus on finding a special SE topic, conduct research on appropriate learning resources, and explore the topic in depth. Furthermore, they learn the process of understanding the requirements derived from implementing their specialty topics and become familiar with the respective tools and methods related to this project. By applying these in the scope of a project, students learn to gain professional knowledge and application skills in a chosen topic in a self-directed manner.

It is possible to take multiple of the modules SE_51 to SE_56 in one semester, but they need to be taken in ascending order (SE_51 - SE_53 as well as SE_54 - SE_56) to avoid confusion. Further, the topics must not overlap, nor may the topic of a specialty module overlap with other modules' topics.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify a domain of interest
- Evaluate appropriate learning resources
- Demonstrate professional knowledge and application skills in the chosen topic
- Apply the learned skills in a practical or research project

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_54 | Software Engineering Specialty

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	60 hrs.	Frequency:	Every Semester
Self-study:	240 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Software engineering is both a very broad domain and a domain of rapid change. New technologies evolve fast, others are niche topics only covered by some experts. Students in this module focus on finding a special SE topic, conduct research on appropriate learning resources, and explore the topic in depth. Furthermore, they learn the process of understanding the requirements derived from implementing their specialty topics and become familiar with the respective tools and methods related to this project. By applying these in the scope of a project, students learn to gain professional knowledge and application skills in a chosen topic in a self-directed manner.

It is possible to take multiple of the modules SE_51 to SE_56 in one semester, but they need to be taken in ascending order (SE_51 - SE_53 as well as SE_54 - SE_56) to avoid confusion. Further, the topics must not overlap, nor may the topic of a specialty module overlap with other modules' topics.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify a domain of interest
- Evaluate appropriate learning resources
- Demonstrate professional knowledge and application skills in the chosen topic
- Apply the learned skills in a practical or research project

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_55 | Software Engineering Specialty

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	60 hrs.	Frequency:	Every Semester
Self-study:	240 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Software engineering is both a very broad domain and a domain of rapid change. New technologies evolve fast, others are niche topics only covered by some experts. Students in this module focus on finding a special SE topic, conduct research on appropriate learning resources, and explore the topic in depth. Furthermore, they learn the process of understanding the requirements derived from implementing their specialty topics and become familiar with the respective tools and methods related to this project. By applying these in the scope of a project, students learn to gain professional knowledge and application skills in a chosen topic in a self-directed manner.

It is possible to take multiple of the modules SE_51 to SE_56 in one semester, but they need to be taken in ascending order (SE_51 - SE_53 as well as SE_54 - SE_56) to avoid confusion. Further, the topics must not overlap, nor may the topic of a specialty module overlap with other modules' topics.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify a domain of interest
- Evaluate appropriate learning resources
- Demonstrate professional knowledge and application skills in the chosen topic
- Apply the learned skills in a practical or research project

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

SE_56 | Software Engineering Specialty

Details

Credits:	10 ECTS	Semester:	2 – 5 (Core)
Contact time:	60 hrs.	Frequency:	Every Semester
Self-study:	240 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Ulrich von Zadow	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

Software engineering is both a very broad domain and a domain of rapid change. New technologies evolve fast, others are niche topics only covered by some experts. Students in this module focus on finding a special SE topic, conduct research on appropriate learning resources, and explore the topic in depth. Furthermore, they learn the process of understanding the requirements derived from implementing their specialty topics and become familiar with the respective tools and methods related to this project. By applying these in the scope of a project, students learn to gain professional knowledge and application skills in a chosen topic in a self-directed manner.

It is possible to take multiple of the modules SE_51 to SE_56 in one semester, but they need to be taken in ascending order (SE_51 - SE_53 as well as SE_54 - SE_56) to avoid confusion. Further, the topics must not overlap, nor may the topic of a specialty module overlap with other modules' topics.

Qualification Objectives

Students who successfully pass this module are able to:

- Identify a domain of interest
- Evaluate appropriate learning resources
- Demonstrate professional knowledge and application skills in the chosen topic
- Apply the learned skills in a practical or research project

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

STS_01 | STS Essentials

Details

Credits:	6 ECTS	Semester:	1 (Orientation)
Contact time:	45 hrs.	Frequency:	Annually
Self-study:	135 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	None	
Module Coordinator:	Prof. Dr. Fabian Geier	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

STS Essentials is a module in the history of thought, academic writing, analytical thinking, ethics, and philosophy, with references to problems of technology. The module covers philosophical inquiry about truth and reality, ethics and politics, art and beauty, as well as questions of social justice, cultural studies, and the role of technology in society. The practical focus of STS Essentials is on academic writing, which is practiced through various written assignments.

The STS Essentials module requirements can only be fulfilled by attending the obligatory Learning Units of the same name that are offered.

The assessment is based on an essay as well as performance in class. How these aspects are graded and weighted is determined by the respective lecturer.

Qualification Objectives

Students who successfully pass this module are able to:

- Describe and discuss central pieces of the history of ideas and apply basic concepts from philosophy, history, sociology, psychology, politics and economics.
- Understand structured academic writing, analytical thinking, knowledge, and reflection about central questions of humanity

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

STS_02 | Academic Reading

Details

Credits:	5 ECTS	Semester:	2 - 5 (Core)
Contact time:	30 hrs.	Frequency:	Every semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Fabian Geier	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

The Academic Reading module engages with liberal arts topics by focusing on academic reading. Typically, this involves the analysis of a single book or several texts of comparable workload in the humanities or social sciences.

The assessment is based on the overall performance in the course or project. Students demonstrate that they understand and can present the text, apply its contents and place it in a larger context, and examine it critically and independently while doing justice to the text and its context. The details of the assessment are determined by the respective Learning Unit lecturer or the supervisor of the reading or reflection project.

Qualification Objectives

Students who successfully pass this module are able to:

- Extract knowledge and understanding from any kind of written corpus, particularly in the context of addressing liberal arts questions
- Read actively (e.g. taking notes, marking excerpts)
- Analyze structure of a text (e.g. function, architecture, theses, arguments)
- Recognize attitude, premises and implicit messages
- Analyze context and style (both historic and rhetoric)
- Read at different speed levels (e.g. skimming, close reading, etc.)

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

STS_03 | Research

Details

Credits:	5 ECTS	Semester:	2 - 5 (Core)
Contact time:	30 hrs.	Frequency:	Every semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Fabian Geier	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

The Research module engages with liberal arts topics by focusing on research skills.

The details of the assessment are determined by the Learning Unit lecturer or the supervisor of the reading or reflection project.

Qualification Objectives

Students who successfully pass this module are able to:

- Analyze questions in liberal arts through research of relevant themes in academic literature
- Select and read state of the art research and document findings in a structured way (and/or) conduct basic quantitative and qualitative research and document the findings in a structured way
- Understand basic research standards especially with regard to writing academic papers.

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

STS_04 | Presentation

Details

Credits:	5 ECTS	Semester:	2 - 5 (Core)
Contact time:	30 hrs.	Frequency:	Every semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Fabian Geier	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

The Presentation module entails engaging with liberal arts topics by presenting them in a public or semi-public setup.

The assessment consists of giving at least one presentation about a question from a field in the liberal arts or an artistic performance or show. The details of the assessment are determined by the Learning Unit lecturer or the supervisor of the reading or reflection project.

Qualification Objectives

Students who successfully pass this module are able to:

- Acquire skills and knowledge regarding structured expression and delivery of liberal arts content in public settings
- Develop physical and mental self-awareness
- Demonstrate the ability to talk no nonsense for extended periods of time

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

STS_05 | Judging Technology

Details

Credits:	5 ECTS	Semester:	2 - 5 (Core)
Contact time:	30 hrs.	Frequency:	Every semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Fabian Geier	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

This module is an opportunity for students to learn about and reflect on digital technologies and make judgments about their effects on individuals and societies. Students participate in a Learning Unit offered by STS to further develop their thoughts and judgements about technologies.

The details of the assessment are determined by the Learning Unit lecturer or the supervisor of the reading or reflection project.

Qualification Objectives

Students who successfully pass this module are able to:

- Acquire wide-ranging knowledge and understanding about current digital technologies, their impact on society, and their philosophical, political, and ethical implications

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

STS_06 | Sustainable and Regenerative Development

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Annually
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Florian Grote	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

This module introduces the concept of “sustainable development” in the context of technology and innovation. The objective is to provide students with a background into the conceptual origin of the term, an understanding of what is happening now, and a vision into how emerging technologies will impact the debate in the years to come. Getting a grasp of the goals, challenges and complexities of sustainable and regenerative development helps students to develop critical thinking skills and a solutions-oriented mindset by showcasing examples of today’s most promising solutions for the future.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the basic concept of sustainable development, its environmental, social, and economic dimensions, and its relation to regenerative development
- Analyze and evaluate the dependencies, conflicts, and potentials around sustainable and regenerative development
- Analyze and evaluate the challenges and potentials for the technology sector in terms of responsibility and potential for innovation
- Create scenarios and action plans for sustainable and regenerative initiatives in multi-stakeholder ecosystems

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

STS_07 | Self-Directed Learning

Details

Credits:	5 ECTS	Semester:	2 – 5 (Core)
Contact time:	30 hrs.	Frequency:	Every Semester
Self-study:	120 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	OS_01; OS_02; OS_03; OS_05	
Module Coordinator:	Prof. Dr. Adam Roe	
Module Applicability:	B.A. Interaction Design	Elective
	B.A. Product Management	Elective
	B.Sc. Software Engineering	Elective

Contents

The learning sciences is a rapidly evolving field which seeks to understand and design for how we learn. In this module, students learn about the fundamentals of the field of learning science and apply a selection of best practices to their own learning process. Students engage deeply with best practices such as active recall, interleaving, spaced learning, and metacognition and be able to apply these in practice. Students also become familiar with neurophysiological and psychological influences on learning, as well as consider how human memory seems to work. Students learn about the field of learning sciences itself and select a learning journey themselves, on which to actively apply selected methods of the field.

Qualification Objectives

Students who successfully pass this module are able to:

- Understand the fundamentals of the learning sciences
- Select and apply key methods to their own learning process
- Reflect on the learning process, including on the process of learning about learning itself

Learning Resources

Learning resources are announced in advance at the beginning of each semester.

BA_01 | Capstone Project

Details

Credits:	15 ECTS	Semester:	6 (Synthesis)
Contact time:	0 hrs.	Frequency:	Every Semester
Self-study:	450 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	Refer to applicable Study and Examination Regulations (SER)	
Module Coordinator:	Examination Office	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

Throughout their studies, students have continually honed various skills through semester projects. In these projects, students had the opportunity to learn the basic skills and best practices of their study program and specialize according to their interests in a practical context.

The capstone project module imparts a holistic understanding of the student's accumulated knowledge and experience in their chosen study program. Students learn how the basic skills and best practices from their study program fit together, how to work on complex projects within their chosen speciality, as well as learning to take on a leading role.

Qualification Objectives

Students who successfully pass this module are able to:

- Apply techniques and best practices from their study programs to a complex project in a holistic manner
- Exhibit mastery in a specialized topic
- Apply knowledge interactively in contexts and situations outside of project teams

Learning Resources

Learning resources are identified by the student as part of their research and, if applicable, in liaison with the supervisor(s).

BA_02 | Bachelor Thesis

Details

Credits:	15 ECTS	Semester:	6 (Synthesis)
Contact time:	0 hrs.	Frequency:	Every Semester
Self-study:	450 hrs.	Grading:	Graded

Teaching Format:	Lecture; seminar; course; project work; case study	
Assessment Type:	Oral/practical examination; written examination	
Prerequisites:	Refer to applicable Study and Examination Regulations (SER)	
Module Coordinator:	Examination Office	
Module Applicability:	B.A. Interaction Design	Mandatory
	B.A. Product Management	Mandatory
	B.Sc. Software Engineering	Mandatory

Contents

The bachelor thesis is a text that demonstrates the student is able to independently work on a problem in a scientifically appropriate way. The topic of the thesis can be chosen by the student and should (but does not have to) relate to the chosen topic of the capstone project.

During a colloquium, students are expected to answer questions related to the topic of their thesis and take an active part in an academic discussion.

Qualification Objectives

Students who successfully pass this module are able to:

- Select a topic and work independently using scientific practices
- Conduct a literature search according to scientific sources
- Select, apply, and if necessary, adapt suitable scientific procedures and methods
- Compare and evaluate results critically within the state of research
- Communicate results clearly and in an academically appropriate language
- Answer questions related to the topic of the thesis in an academic discussion

Learning Resources

General resources on writing a bachelor thesis are provided by the supervisor(s). Learning resources specific to the student's bachelor thesis are identified by the student during their research and, if applicable, in liaison with the supervisor(s).