Høyskolen Kristiania

Programme description

Master of Human-Computer Interaction

120 credits

2020-2022

The study programme was accredited by NOKUT 23.01.18
The programme description has been approved by the Education Committee 26.09.19 (UU/EIT-case no. 11/19)

Content

1. Introduction

The discipline of Human-Computer Interaction (HCI) is interdisciplinary in its core, and it brings together knowledge and understanding from computer science, design, psychology, and other related behavioral sciences. Candidates will acquire skills and competence in areas such as system interfaces, technology, software architecture and the humans that interact with them to name but a few.

The master program in HCI aims to meet current needs for better IT systems, by taking the user perspective into consideration throughout the design and development phase. It is targeted at candidates who want to influence and define how humans will interact with technology in the future, including designing and developing IT solutions. The Master program combines theoretical and practical approaches to HCI in order to provide advanced knowledge about versatile user needs and requirements for IT systems of high usability. Upon completion, candidates will be prepared for exciting challenges within contexts of HCI.

Relevance for public and private sector
Candidates from this program will work towards defining the ways humans interact with technology and will contribute to bringing technology forward as a premise for innovation and prospects within HCI. We increasingly depend on IT systems in our everyday lives, in everything from the work situation, to the use of cars and home appliances. Also, important tasks like banking services, medical services and voting depend on systems that everyone can use, independently of their personal abilities.

Understanding human abilities and limitations in interacting with technology is a crucial skill in the current and future work environment. Designing and developing technological solutions that people can use, will be crucial both to achieve a society without barriers, but also for companies that want to attract customers. Candidates from the HCI program will have the skills and knowledge to understand both the possibilities and limitations that lies in human-computer interaction.

Typically, graduating candidates can fill positions as:

- Human-Computer specialists
- Interaction designers
- Experience designers
- Web, software or system developers
- Usability designers
- Project managers
- Researchers

What differs from existing interaction design programs is the interdisciplinary link between computer science and design. Candidates can choose their own focus; by gaining expertise within technologically-oriented HCI, or seek in-depth knowledge of human-oriented HCI, or to place themselves somewhere in between. There are no specific specializations in the programme, but the candidates can choose different focus areas through;

- choosing different electable topics, where some are technology-oriented, and some are more human-oriented,
- participating in different types of projects in some of the modules, i.e., developing prototypes or carrying out full implementations, and
- selecting and refining the topic of their master thesis, where some may be anchored in a technological paradigm, and others may be purely design- or human-oriented.

Nonetheless, they will all master a certain level of skills from both paradigms making them able to bridge the gap between technology and design.

Relevance for further studies

As an academic field, HCI constitutes an extensive research community, which typically recruits PhD candidates from HCI or computer science master studies. The Master of HCI will provide a strong foundation for third cycle (PhD) studies, in the following ways:

- The broad theoretical curriculum, including the main areas of HCI research, will provide the candidate with a solid knowledge platform.
- Deep understanding and experience in prototyping, designing, implementing and evaluating state of the art IT artefacts and HCI solutions.
- The two research courses (*HCI – Methods and Frameworks* and *Research Design and Methodology*) will provide the candidate with methodological skills that fulfil the normal requirements for admission to a PhD programme.
- Working on their thesis, the students will develop the skills to conduct an independent research project.

Overall, the students will acquire academic depth and critical reflection as a foundation for a future PhD project.

1.1 Prerequisites

Target candidates hold a Bachelor's degree in Computer Science, Information Technology, Information Systems, Human Computer Interaction, Interaction design or related disciplines.

It is *required* you have prior knowledge of:

- Basic knowledge of web technologies: HTML and CSS

It is *recommended* you have prior knowledge of:

- Basic understanding of Usability and / or UX
- Basic understanding of interaction design
- Basic programming or scripting skills (i.e. Java, PhP, Python, JavaScript, etc.)

2. Learning outcomes

All study programmes at Kristiania University College have adopted overarching learning outcomes that each student is expected to have achieved having completed the course. The learning outcomes describe what the student is expected to be able to do as a result of the learning acquired throughout the course. The academic outcome is divided into three categories: Knowledge, Skills and General competence.

Knowledge

The candidate…

- has advanced knowledge in human computer interaction as a research field, in terms of theories, knowledge claims, research methods, tools, technologies and professional standards.
- has specialised knowledge within user-centred design and interaction design.
- has knowledge in ICT solutions and specialised knowledge within architecture, implementation and SE methodologies relevant for HCI.
- is able to gain new knowledge in the field of HCI.

Skills

The candidate…

- is able to apply this knowledge, and to reflect on how HCI methods contribute to close the gap between research findings, business needs and societal aims.
- can reflect on their professional practice and adjust this under guidance.
- can find, assess and refer to information and technical material and present it so that it highlights a problem.
- can master the relevant professional tools, techniques, frameworks and forms of expression.
- can design and implement interactive prototypes and user interfaces, using modern third generation web technology frameworks.

General competence

The candidate…

- has insight into relevant professional and ethical issues within HCI.
- can plan and execute a variety of tasks and projects that extend over time, alone and in groups, and in line with ethical requirements and guidelines.
- can convey key subject matter as theories, issues and solutions both in writing, orally and through other relevant forms of expression.
- can exchange views and experiences with others with backgrounds in the art and thereby contribute to the development of good practice.
- can reflect on synthesised knowledge from the field of HCI and its implications.
- can present the results from extensive independent work, mastering the terminology of the field

3. Structure and content

The programme is run over two years (full-time) or three years (part-time). For full-time students the first year offers five specialization courses, in addition to two courses shared with existing master programmes at the faculty, and one electable course. For part time students these eight courses are taken over two years. The last year focus on the Master Thesis, as well as one elective course.

Master of Human Computer Interaction Full-time				
1. semester	**HCI Methods and Frameworks** 7,5 ects	**Interaction Design Studio** 7,5 ects	**Visual Analytics** 7,5 ects	**UI Programming and Architectures** 7,5 ects
2. semester	**Elective** 7,5 ects	**Agile Project Management** 7,5 ects	**Multimodal Interaction** 7,5 ects	**Research Design and Methodology** 7,5 ects
3. semester	**Master Dissertation** 52,5 ects			**Elective** 7,5 ects
4. semester				

*The courses are thought as modules, meaning that the students usually will complete one module before starting the next.

Master of Human Computer Interaction Part-time			
1. semester	**HCI Methods and Frameworks** 7,5 ects	**Visual Analytics** 7,5 ects	
2. semester	**Elective** 7,5 ects	**Multimodal Interaction** 7,5 ects	
3. semester	**Interaction Design Studio** 7,5 ects	**UI Programming and Architectures** 7,5 ects	
4. semester	**Agile Project Management** 7,5 ects	**Research Design and Methodology** 7,5 ects	
5. semester	**Master Thesis** 52,5 ects		**Elective** 7,5 ects
6. semester			

*The courses are thought as modules, meaning that the students usually will complete one module before starting the next.

3.1 Academic progression[1]

The first semester modules take the candidates through different aspects of designing, prototyping, developing, and testing software applications and user interfaces for HCI. The aim is to give the candidates the necessary foundation for specializing in their area of interest. In the first course, *HCI – Methods and Frameworks*, the students are introduced to theories, principles, methodologies and frameworks commonly used in the field. Typical research streams and challenges in HCI are also introduced. The following course, *Interaction Design Studio* gives the candidates a foundation in interaction design, making the students able to plan and conduct the design process, and become familiar with interaction design principles and frameworks. Theory and practical exercises, combined with group projects, give this common fundament. *Visual Analytics* introduces issues and theories of visualization and perception, in the context of business intelligence dashboards. Later, in *Multimodal Interaction*, the principles of perception from this course are returned to and further elaborated on. To provide the students with a more technical foundation, making them able to contribute to develop HCI technology and software, *UI Programming and Architectures* provides necessary knowledge and skills in designing, prototyping and implementing UI software solutions, bridging the gap between designers and programmers.

The second semester starts with one of two electable courses in the program, which give the students the opportunity to further engage in in-depth knowledge of a topic of interest, or to broaden their scope and area of knowledge by selecting a related module that expands their horizon. Examples of electable courses includes *"Social and Behavioral Science", "Mobile Computing"* and "*Consulting and Leadership*". For a full example listing please refer to Appendix 1. The first electable course is followed by *Agile Project Management*, which has the objective of introducing the students to relevant project management methodologies. Thereafter *Multimodal Interaction*, which is one of the most specialized subjects in the program, returns to and further explores the issues, concepts and solutions regarding technology, interaction and perception using one or more modalities, like sound, haptics, and smell, in addition to vision. This builds upon knowledge previously acquired in *Visual Analytics and UI programming and architecture.* The students are given the choice, depending on their skills and interest, to particularly focus on technical challenges related to development of multimodal solutions, or to focus on user and design related issues in the context of perception and modality. The final course in the first year, *Research Design and Methodology*, provides the students with the necessary foundation for starting the master thesis. The course elaborates on topics addressed in HCI - Methods and Frameworks and extends the students' knowledge and skills in research methodology. Upon completion, the students are prepared to plan and conduct a research project for their Master thesis. With an

[1] The academic progression is described according to the full-time programme. For part-time students the chapter on the first semester will be their first and second semester, and the chapter on the second semester will be their third and fourth semester.

almost complete first year, the students can now be given detailed knowledge and skills in selected research methods, research ethics, evaluation to mention but a few. After conducting the final module, *Research Design and Methodologies*, they will have a foundation to make an informed choice of point of departure for the master thesis.

During the remaining semesters 3 and 4, the candidates spend most of the time working on their master thesis, in addition to their second elective. The second year has a stronger focus on general competence, aiming at synthesizing all knowledge and skills into the ability to conduct their master project. This enables the students to draw on and integrate wholly all learning, and through their project advance a small part of the academic field.

3.2 Relation to research

Today's society are experiencing an exponentially increasing use of technology and technological solutions operating across multiple platforms. With this as a background, it is highly relevant to focus on HCI to facilitate good user experiences and usability. Underlying this there are many aspects to address, ranging from prototyping, designing, implementing, testing, evaluating, to disseminating research results. Contemporary issues, all separate research streams related to HCI, includes; user interface design, input and output through novel multimodal user interfaces, software architectures, mobile solutions, infrastructure and distribution models. For researchers in HCI it is increasingly important to contribute to innovation activities and the development of products and systems in which the environment and social issues are taken into consideration.

The current research challenges in HCI are broad in their nature. Common to most HCI research projects is the cross-disciplinary aspects, and the needs for a range of different skills and knowledge to solve the research problems involved, from human cognition and perception to more technology-oriented areas like programming, sensor technology and machine learning.

Below is a list of examples of current HCI research issues that are planned to be incorporated into the program.

Multimodal interaction: As user input continues to shift from keyboards to gestures, speech, and body movement, users will need reliable mechanisms to express their intentions. Expansion of tactile and tangible environments provide fresh possibilities. There is an increasing emphasis on interfaces involving other senses than our vision. Use of smell, sound, haptics as well as visual perception, opens to a range of different interaction options, as well as challenges. The area of multimodal interaction involves issues related to perception and interaction, in addition to technological issues like synthesis of data.

Activity-theoretical HCI: During the last two decades, activity theory has become a growing and central post-cognitivist approach and concept in HCI research. Activity theory is

described as a framework that considers whole systems of organizations, work practices, technology and artefacts. It also involves the cognitive capacity of individuals, with all their culture, history, experience, understanding and contextual complexity that goes into the very activities human *agents*, do or must relate to, in our quest to fulfil our needs or reach our objectives. Thus, it is well suited as a theoretical lens for analyzing the character of intuitive activity in a human-computer context as it provides a methodological approach and the tools for understanding patterns in the context of goal-oriented human use of technology.

Intuitive interaction in user interfaces: The terms intuitive, intuition, intuitiveness, and intuitive use of products involve utilizing knowledge gained through other experiences. Therefore, products that people use intuitively are those with features they have encountered before. Intuitive interaction is fast and generally non-conscious, and people may be unable to explain how they made decisions during intuitive interaction. The cognitively based '*intuition*' and the activity-theoretical '*intuitive use*', are grounding intuitiveness in the realm of recollection of process, labelling 'intuitive use' as mediated intuitive action in an activity theoretical approach to intuitive interaction in user interfaces.

Virtual Reality (VR) and Augmented Reality (AR) are fields that is resurging, both for education, work, health and entertainment. As the technology is getting cheaper and of better quality, the potential for widespread use increases. However, several issues still need to be resolved, like how to give the user a sense of presence and improving the user experience and overcoming limitations in the technology.

Accessibility and universal design: the two related areas of research and development are focused on solutions that can be used by everyone, independently of their abilities or disabilities. The field of accessibility are mainly focused on how to overcome human limitations like visual impairment, for instance through adaptations, while universal design is aiming for solutions that do not challenge anyone independently of their disabilities. The research issues in these fields involves pure technical ones, regarding how to design and develop user interfaces that is accessible for everyone, as well as establishing guidelines and strategies for designers, developers and companies what want to achieve accessible and/or universally designed solutions.

Affect and interfaces focus on how to incorporate human emotions into HCI. The main emphasis is on how to detect and influence emotions through the interfaces. Novel interfaces that encourage reflection on past experiences and intended actions with a calm and mindful attitude could enhance life experiences, creative processes, and self-awareness. Reflection about life's challenges, life changing decisions, and ones' position in the digital life, can be difficult, but if successful lead to comforting clarity.

Web architectures and interface design investigate
The big data movement is generating a high volume and a variety of data whose analysis could lead to a better understanding of user interface design. With this underlying fundament, the need for rapidly evolving architectures with speedy adaptability for evolving technology

frameworks have become ever more important. Configurable infrastructures and architectures could well soon lead to configurable interfaces to solve the modern ubiquitous design challenges.

The HCI program has been designed to give a foundation of knowledge and skills to the candidates, so that they are able to contribute in a range of projects. Their individual level of expertise in each field, will depend on their choice of electable courses, and their master thesis topic. As a result, the master program will produce candidates in a broad range, from interaction designers with expertise in design and perception, to full stack frond-end developers with more in-depth technology skills.

3.3 Courses

Course name	Credits	Description
HCI Methods and frameworks	7,5	The discipline of Human-Computer Interaction (HCI) involves knowledge and understanding of the system interfaces and the humans that interacts with them. The aim of this research area is to be able to build interfaces that work, and to evaluate them. Achieving this goal, requires a thorough understanding of the abilities and constraints of the people using computer interfaces. Models and theories applied in the field of HCI come from a range of different areas, like psychology, sociology and computer science, in addition to some theories developed specifically for HCI. In this course, the student will be introduced to theories and frameworks commonly used in the area of HCI, in addition to becoming familiar with typical research issues and challenges studied in the field. The students will learn how to write a reaction paper.
Interaction Design studio	7,5	This module focuses on advanced topics in interaction design, exploring the various interfaces through which humans interact, and the characteristics of how human interaction is perceived as intuitive. The course will explore the sequential character of user experience based on the fields of Service Design and Design Thinking. The student will gain knowledge in the process from gathering user requirements, to design and implementation through lab-oriented development-methods.
Visual Analytics	7,5	Students will gain knowledge about theoretical principles of and computational techniques for visual analytics. The course will enable students to design, develop, and evaluate information dashboards for organizations. The students shall be able to reflect upon the different models, theories, and frameworks for technology integration from a visual analytics perspective.
UI Programming and Architectures	7,5	This course aims for the students to gain a foundation in how to program user interfaces and understanding of the underlying system architecture. Candidates will acquire advanced understanding in interaction techniques, design cycles and prototyping. Further knowledge of the terminology used by programmers aim to bridge the gap to developers. In practical skills the candidates will be required to design, implement and test/evaluate prototypes, through their developed user interfaces, chosen input/output techniques and

		executable programs. After successful completion of the course it is expected critical reflection on contemporary themes within user interfaces and the ability to critically discuss suitable UI approached to align with underlying system architecture.
Agile Project Management	7,5	Organizations need to develop project managers who can complete projects on time and within budget and this course addresses challenges such as the ability to manage projects and stakeholders, risk assessment and agile planning. Students will gain advanced knowledge of the key theories of project management and agile development. They will acquire specialised problem-solving skills, being able to plan and run a time-boxed iteration, and to use a project management tool. They shall take responsibility to conduct plan, organise and control an agile IS project.
Multimodal Interaction	7,5	Most interactions with the physical world involve several senses, along with the motor system. Similarly, many digital services are designed for natural experiences and intuitive interactions, aiming to accommodate human perception, performance and cognition. Multimodal interfaces process and align two or more combined user input modes, such as speech, touch, manual gesture, gaze, and head and body movements. The inputs are in turn processed and coordinated with multimedia system output, be it audio-visuals or even scents or haptic stimuli. These interfaces aim to recognise naturally occurring forms of human language and behaviour, which incorporate one or more recognition-based technologies (e.g. speech, pen, vision). This course will give students a theoretical and practical introduction to multimodal communication and different types of HCI interfaces. The main focus of the course is to make students familiar with techniques for • *user input*, such as speech recognition, touch screens or eye and gesture tracking, • *computer output*, such as unconventional display devices, speech synthesis, sounding objects and haptic devices. In particular, the effects of combining different modalities, as well as the related technological challenges, are addressed.
Research Design and Methodology	7,5	Research is a cyclical process where new and carefully planned investigations build and extend on established work. The aim is to provide students with a fundamental understanding of research as a conceptual, empirical and practical approach to gathering new insight and knowledge within HCI. Teaching centres on applied research from the field of HCI and presents students with relevant methods from this domain, along with their possibilities and limitations. Emphasising the importance of background work with a solid understanding of past research, an important outcome of this course is a structured literature review that forms the foundation for a project plan. Furthermore, students will learn a systematic approach to empirical investigation, including research design and

		methodology, qualitative and quantitative analyses, and the presentation and evaluation of results. At completion of the course, students will be prepared to begin work on their own research project.

3.4 Electable subjects

In both the 2nd and 3rd semester[2] students will be able to choose one electable course within the field of technology, which gives the students the opportunity to further engage in in-depth knowledge of a topic of interest, or to broaden their scope and area of knowledge by selecting a related module that expands their horizon.

What topics that can be chosen may vary from year to year. The concrete topics are presented and published in advance together with the deadline for enrolment in individual electable subjects.

3.5 Master Thesis (52,5 ECTS credits)

The aim of this course is to provide the student with an opportunity to develop systematic understanding and critical awareness on the solution of a relevant problem in the student's focal area. Students will gain advanced knowledge of the research process at Master level, including a deep knowledge of selected theories. They will acquire specialized problem-solving skills, be able to plan and conduct the steps in the research or development process at a high standard. They shall take responsibility to conduct a well planned and executed project at Master level.

On a more detailed level, the student will, based on observations of the industry and the existing body of knowledge, develop a research project. It is also be able to do the Master Thesis in relation to an ongoing research project at Department of Technology. As part of the thesis the student will conduct a literature review and establish a research question. Independently, or in a group of two, the student will plan, execute and evaluate the research project according to established research methods in HCI.

[2] 2nd and 5th semester for part-time students.

4. Internationalization and international student exchange

The course has schemes for internationalisation and international student exchanges, according to the Regulations on the Supervision and Control of the Quality of Norwegian Higher Education (Studietilsynsforskriften) of February 2017 (§ 2-2, sections 7 and 8)

The schemes for internationalisation are adapted to the level, scope and uniqueness of the course.
The content of schemes for international student exchanges is academically relevant.

4.1 Internationalisation

Internationalization means the collective efforts regarding international activities. The internationalization efforts at the department of Technology includes research collaborations, staff- and student exchange, participation in international conferences, publications, competitions, displays, etc. The students are actively involved in our international network and its activities at Kristiania University College enabling them to gain valuable insights and experiences. Scientific staff is given options for participating in their international networks to keep their knowledge up to date, gain valuable experiences and share and learn new pedagogical techniques. Our membership in networks such as Erasmus+ and Nordplus, give students and academic staff rich opportunities.

For the specific courses in the programme, they are all taught in English, thereby facilitating for incoming exchange students. Historically, approximately one third of the class size consists of international students which encourages an international student environment. Further, in several courses there are guest lectures delivered by international visiting staff. Some of the courses are also delivered by international staff in adjunct positions from our partner institutions such as Copenhagen Business School, Denmark and Brunel University, UK. Through coursework and assignments, the students will work on cases from international actors and companies, relating their reflections, discussions and hand ins to a global IT industry and its professional community.

For specific internationalization schemes, see the subject description of the study.

4.2 International student exchange

With regard to schemes for international student exchanges, the university college offers the following mobility programmes;

- Nordplus in the Nordic and Baltic countries
- ERASMUS+ in Europa
- ‘Study Abroad’, for students within and outside Europe

Kristiania University College has agreements on student exchanges and academic relevance secured by the academic field of study. Exchange courses from partners are approved by academic supervisors, for admission to the program, with an equivalent of 30 credits.

For nominations for student exchange, requirements are set for grades and motivation applications. For some study programmes there are requirements for documentation of creative work / portfolios.

For students at Master of Human-Computer Interaction student exchange is possible during the 3. semester. While on exchange the student will be able to start their master thesis with an advisor from Kristiania University College. For outgoing students, Kristiania University College, has established student exchange agreements with the following institutions:

- Kingston University, UK: Master Programme
- Seoul, South-Korea: Seoul National University of Science and Technology
- England: University of Hertfordshire, UK
- New Zealand: Otago Polytechnic New Zealand (1 student only)

Changes to approved universities may occur. Information about possible exchange stays for the relevant year is therefore published online and on the learning platform.

5. Teaching methods

The individual courses, except the thesis, are structured in block mode for four weeks. The first two weeks will be a combination of lectures, case studies, in-class presentations and lab work. Guest lectures will be organized on chosen topics. Students work in groups under supervision. The two last weeks are for self-study, project work and oral exam. The master thesis is a self-organized period of study where the students draw upon plenary lectures, individual supervision and self-organized group work.

Overall, the programme will draw on a combination of lecturing forms:

- Lectures, to introduce theoretical issues and domain knowledge.
- Seminars and group work, to give the students the opportunity to discuss different perspectives, integrate with previous knowledge, and practice analytical assessment of case materials.
- Practical assignments and lab work, to develop hands-on technical skills.
- Directed and student-selected readings, to develop a solid knowledge base.
- Technical demonstrations, to present and convey the technical workings and user interaction aspects of an IT artefact.
- Oral presentations, to develop personal communication skills.
- Essay and thesis writing, in order to synthesize knowledge and present analyses and results.
- Supervision, to provide detailed feedback and discussion of student projects in close interaction with Høyskolen Kristiania researchers.

5.1 Forms of assessment

Regarding assessment forms, the students will write essays, technical reports, articles, reflection documents, poster, and similar written hand-ins. In addition, oral presentations, poster demonstrations, product demonstrations, prototyping, and lab work are examples of other assessment forms. There are usually one or two assessments in each module, and it will alternate between individual assignments and group-based assignments. For the Master Thesis in the last year, there will be both a written thesis document and an oral presentation.