Master´s Programme in Information Networks Study Guide 2016-2017

For the reader

This study guide explains the degree requirements of the programmes, and gives students the necessary information about completing the degree and its contents.

In addition to study guides, Aalto University uses various online services for planning and monitoring one's studies, and for keeping up with what is going on at the university. In planning one's studies, this study guide and the online tools complement each other and should be used side by side.

Below is an introduction to students' most important online tools:

WebOodi
Course descriptions, registering for courses and exams, planning your studies (personal study plan)

MyCourses
Course home pages, timetables, materials, course spaces, course news

Study guide
Degree structure and the courses it consists of

Into is a student portal, with information about studies, Aalto services and Aalto university in general.

The Into pages of the School of Science give you general information about studies: timetables, instructions on registration, advice on how to plan your studies and draw up a personal study plan, forms, information about studies abroad or in other Aalto schools or other Finnish universities, common practices in courses, academic rules and regulations etc. into.aalto.fi/display/fimastersci.

Degree Structure

Director of the degree programme: Professor Eila Järvenpää

Abbreviation: INF

Description of the programme

The Master's Programme in Information Networks is a trans-disciplinary study programme in engineering building on information and communication technology (ICT) and digital media. It combines the fields of social sciences, advanced digital technologies and business. The programme offers one major, Information Networks, which will be completed either as a long major (55-65 ECTS) or a compact (40-45 ECTS).

The programme builds on a vision where finding, defining and solving effectively relevant ICT and digital media related challenges is not possible without a holistic understanding about the interplay between technology, business and humans. Accordingly, the Master's students combine in their studies computer science, media technology, industrial management, and business with a human-centered approach. The students can focus on one substance area, or choose to build a broader multidisciplinary combination of competences.

Master's Programme in Information Networks encourages the students to construct their personal study plan in a multi-disciplinary way by offering well-structured study entities of the programme's core substance areas. The in-built trans-disciplinary is strengthened by integrating blended learning methods together with some compulsory studies in philosophy, aesthetics, social media, and research methods. These themes unfold the programme philosophy and provide insights into analyzing and understanding human-centered technology and business development.

The program applies problem-based learning and group assignments, often conducted in real life projects. Thus, the students develop unique collaborative abilities in multidisciplinary problem identification, problem solving, continuous learning, and innovation. The programme prepares students to act as active co-creators, facilitators and integrators of human-centred innovation in the networked world.

Degree requirements

The mandatory elements of the student's curriculum are a major (either long or compact), a Master's thesis, and elective studies (Figure 1 and 2). A compact major is always supplemented with a minor. The Master's degree adds up to 120 ECTS. Figure 1 and 2 illustrate the options of the study structure.

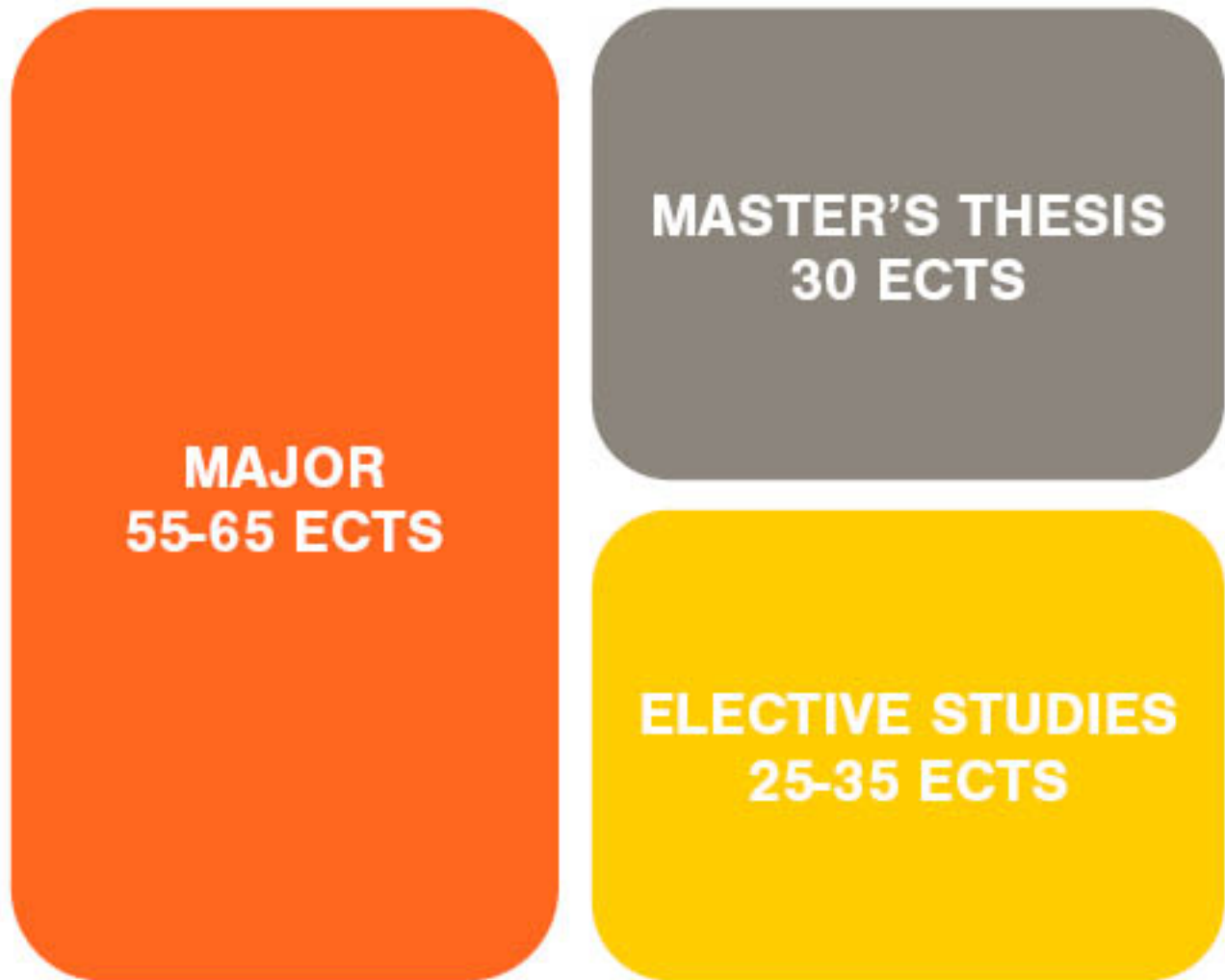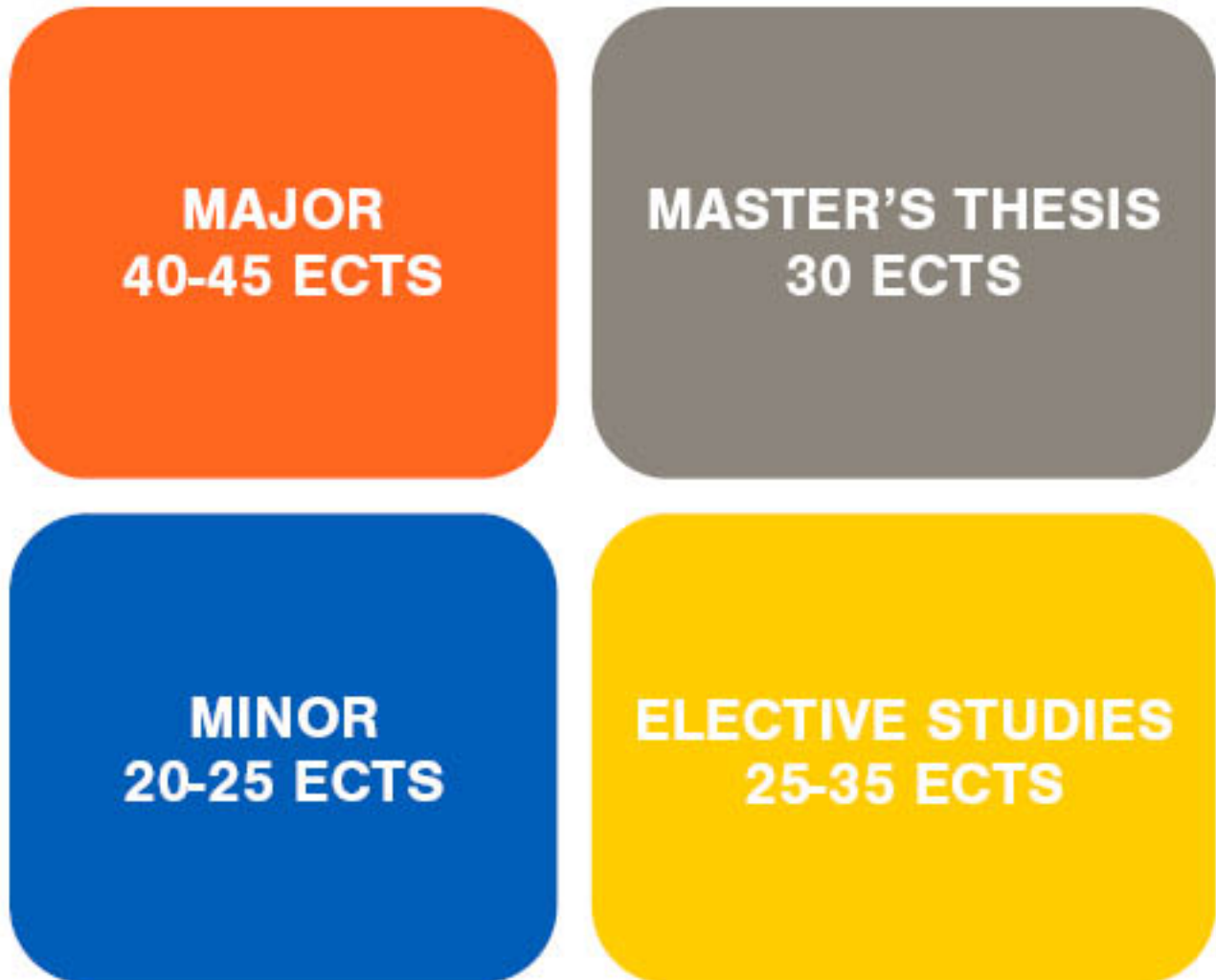**Figure 1. Long major (55-65 ECTS) in Master´s degree in Information Networks.**

Figure 2. Compact major (40-45 ECTS) and a minor (20-25 ECTS) in Master´s degree in Information Networks.

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│                         │   │                         │
│        MAJOR            │   │    MASTER'S THESIS      │
│      40-45 ECTS         │   │       30 ECTS           │
│                         │   │                         │
└─────────────────────────┘   └─────────────────────────┘

┌─────────────────────────┐   ┌─────────────────────────┐
│                         │   │                         │
│        MINOR            │   │    ELECTIVE STUDIES     │
│      20-25 ECTS         │   │      25-35 ECTS         │
│                         │   │                         │
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The specific content of the major depends on the student's own interest areas, so called tracks. The Information Networks major offers four study tracks that are **(1) ICT in Business, (2) Knowledge and Business Networks, (3) Media and (4) User-Centered Design.** Each track equals 20 ECTS at minimum and 30 ECTS at maximum. Moreover, the major includes Information Networks specific studies of 15 ECTS.

Besides the major the programme requires elective studies (25-35 ECTS) and the Master's Thesis (30 ECTS). If the student chooses to take a compact major, a minor (20-25 ECTS) will be mandatory. When starting her/his Master's studies, the student selects his/her main interest area.

During the first semester the student is obliged to make his/her study plan (HOPS) which after its approval acts as a contract between the student and the programme. The student's curriculum must include technological studies 20 ECTS at minimum. The Information Networks specific studies (15 ECTS) are not considered technological. Before approving the study plan the programme will confirm that the proposed study plan will fulfill all the criteria of the programme.

Following the degree requirements the Information Networks Master's student has two possibilities to structure his/her studies:

1. Long major (55-65 ECTS) plus elective studies (25-35 ECTS) and Master's Thesis (30 ECTS)
2. Compact major (40-45 ECTS), minor (20-25 ECTS) plus elective studies (25-30 ECTS) and Master's Thesis (30 ECTS)

The extent of a major may not exceed 65 ECTS. Equally, the extent of a compact major together with a minor may not exceed 65 ECTS. Thus, the students will always have a choice of completely elective studies at minimum 25 ECTS. The students are obliged to complete the chosen majors or minors in that extent they are offered.

A long major (55-65 ECTS) consists of

1. Information Networks specific studies (philosophy, aesthetics, social media, research assignment), 15 ECTS
2. Selected core substance area i.e. a core track from the Information Networks offering, 20-30 ECTS
3. Selected complementary studies from other Information Networks tracks than the core track so that the extent of the long major is fulfilled.

 The student is encouraged to select the core content of the long major to support his/her Master's Thesis interests.

A compact major (40-45 ECTS) consists of

1. Information Networks specific studies (philosophy, aesthetics, social media, research assignment), 15 ECTS
2. Selected core track from the Information Networks offering, 20-30 ECTS
3. Selected complementary studies 0-10 ECTS

A compact major is supplemented with a minor that broadens the student's competence. The student is encouraged to select the core content of the compact major to support his/her Master's Thesis interests. A minor is selected from study entities that are offered as a minor. The professor of the student's core track approves the suggested minor by signing the student's personal study plan (HOPS).

The aims of the education

 The generic aims of the education are listed below:

- Provide the students with a comprehensive understanding on the interaction between human beings and digital technologies on individual, group, organizational and societal levels.

- The students learn about the joint development of digital technologies and business in a novel human-centered, collaborative and creative manner.

More specific, the studies provide

- understanding on the role of technology and information systems within an enterprise and networked business context
- competences to work in development of human-centered, user-friendly ICT-systems for organizations and on society level
- understanding on knowledge and business networks and networking in different contexts, such as creation and developing business and services, creating new knowledge or developing organizational processes in collaboration
- skills to gather, analyze, interpret and present information about users and user experience
- understanding on and creation of media products, e.g. communication platforms or information visualization tools
- learning on conceptual solutions for social phenomena employing crowdsourcing, co-creation and sharing to create novel services.

Minor

The minor is optional and allows the student to broaden her/his competence within the Information Networks Master's Programme, as well as to other fields of technology than information and communication technology. If the major is completed as compact (40-45 credits), a minor must be selected. The minor is confirmed in the Personal Study Plan.

More information on Aalto University's minor subjects:

- [Student Mobility at Aalto: Courses and Minors 2016-2017](#)

Elective studies

Students choose 25-35 ECTS of elective studies. As elective studies, students can complete a minor and/or take individual courses at Aalto University or other Finnish universities. Students can also participate in an international student exchange programme or include 1-5 ECTS of work experience completed in Finland or abroad in elective studies.

For more information on internationalisation or Aalto University's minor subjects:

- [Student Mobility at Aalto: Courses and Minors 2016-2017](#)
- [Internationalisation and studies abroad](#)

Language studies

In Aalto School of Science, students have compulsory language studies as a part of the bachelor's degree. If these language studies have not been completed before entering the master's programme, they must be included in the master's degree as explained in the following:

A student whose language of school education is Finnish or Swedish must take 2 credits in the other national language. In addition, all students must demonstrate both oral (o) and written (w) proficiency in one foreign language (3 credits).

Students with excellent command of English (e.g. English as a first language) may apply for the exemption from the compulsory foreign language requirement and take 3 ECTS of Finnish courses instead. In this case, according to the Degree Regulations, the student has not demonstrated the requisite written and oral language requirement in a foreign language, which is reflected in the appendix of the degree certificate. Students may apply for an exemption in the beginning of each term (deadlines 15 September and 15 January) with an application form available in Into at https://into.aalto.fi/display/enmastersci/Forms.

The language studies are included in the elective studies.

More information about language courses can be found on the Language Centre's website https://into.aalto.fi/display/enlc/

Master´s Thesis

Students are required to complete a master's thesis, which is a research assignment with a workload corresponding to 30 credits. The thesis is written on a topic usually related to the student's major and agreed upon between the student and a professor who specializes in the topic of the thesis. The supervisor of the thesis must be a professor in the University, whereas the instructor(s) must have at least a master's degree.

Master's thesis work includes a seminar presentation or equivalent presentation. The student is also required to write a maturity essay related to the master's thesis. Students are encouraged to take the course **TU-E6080 Master's Thesis Seminar (1-2 cr)** (as a part of elective studies) to get support in the thesis writing throughout the whole Master's Thesis process.

The master's thesis is a public document and cannot be concealed.

Graduation

Students can apply for the master's degree after completing the bachelor's degree, when all courses required for the master's degree have been completed and the master's thesis is done. Students can apply for the approval and evaluation of the master's thesis and for the master's degree graduation in the same Degree Programme Committee meeting. The Dean grants the degrees after the Degree Programme Committee meeting

It is not possible to apply for both bachelor´s and master´s degree graduation in the same Degree Programme Committee meeting.

Master's degree awarded with distinction

Students who have demonstrated excellent knowledge of their field in their studies, and particular maturity and sense of judgment in the master's thesis may be awarded a diploma for the degree of

Master of Science (Technology) with distinction. The decision on awarding a degree with distinction rests with the Dean of the School of Science.

A degree may be awarded with distinction if the weighted grade average of the courses included in the degree, excluding the master's thesis and the grade of the master's thesis are at least 4.0. Courses graded 'pass' or 'fail' shall not be included in the calculation.

Major

Information Networks Major

Professor in charge: Eila Järvenpää

Professors: Heikki Saikkonen, Marjo Kauppinen, Casper Lassenius, Martti Mäntylä, Matti Vartiainen, Markku Maula, Kari Tanskanen, Riitta Smeds, Tapio Takala, Lauri Savioja, Jaakko Lehtinen, Marko Nieminen, David McGookin, Perttu Hämäläinen

Extent: Long major 55-65 ECTS, compact major 40-45 ECTS

The programme offers one major, Information Networks. The major includes compulsory Information Networks specific courses (Table 1) and studies from the selected tracks (see Tables 2, 3, 4, and 5). Thus, the specific content of the major depends on the student's own interest. The student may build his/her competence profile based either on **ICT and Business, Knowledge and Business Networks, Media, or User-Centered Design.** The student is encouraged to select the core content of the major to support his/her Master's Thesis interests.

Table 1. Information networks specific courses (15 credits) compulsory for all the students of the programme.

CODE	NAME	CREDITS	PERIOD	YEAR
TU-E6010	Philosophy	3	I-II	1.
CS-E5600	Aesthetics	3	III-V	1.
CS-E5610	Social Media	4	I-II	1.
TU-E3090	Research Assignment in Leadership and Knowledge Management	5	I-II, III-V	2.

The Research Assignment course will be modular starting with introducing research methods to all Information Networks students. The content of the actual research assignment will be aligned with the core substance area of the student's major.

If any of the Information Networks specific courses has been taken as a part of the student's Bachelor studies, it can be substituted with any of the optional courses of the major or courses in other programs of Aalto, or courses completed in student exchange.

Tracks

ICT in Business

Professor in charge: Kari Smolander

Professors: Marjo Kauppinen, Casper Lassenius, Martti Mäntylä

Extent: 20-30 ECTS

The ICT in Business -track focusses on efficient utilization of enterprise information and communication systems within and across organizations and networks. Well- functioning and meaningful information systems with seamless and accurate information exchange between customers, clients, suppliers and other stakeholders are key resources of knowledge intensive business and services. The track provides understanding about improving the role and impact of information and communication systems in service and business value creation.

Objectives

After completing the compulsory and elective studies of the track the students

- understand the role of and the need for an enterprise and business networks architecture
- understand of the functionalities between information systems (IS) and human to human communication within a networked business context,
- have skills to analyze, improve and develop the relation between the core business processes and the information systems in use.

Content and structure

The ICT in Business track contains selected courses from Software and Service Engineering and Computer Science. The track size is 20-30 credits.

Table 2. ICT in Business track content. Choose courses required to complete a track (20-30 credits). *If some of the compulsory courses are already included in your Bachelor's degree, select courses from the optional courses so that the minimum size of the track is fulfilled.

code	name	credits	period	year
COMPULSORY COURSES 15 ECTS *				
CS-C3120	Human-computer Interaction	5	I-II	1.
CS-C3150	Software Engineering	5	I-II or III-IV	1.
CS-E5300	Enterprise Systems Architecture	5	I	1.
OPTIONAL COURSES				
CS-C3180	Software Design and Modeling	5	I-II	

CS-E4940	Requirements Engineering	5	III-V
CS-E4950	Software Architectures	5	III-V
CS-E5310	ICT Enabled Service Business and Innovation	5	I-II
CS-E5320	Seminar on Enterprise Information Systems	3-10	Upon agreement
CS-E5340	Introduction in Industrial Internet	5	IV
CS-E5360	Systems of Systems	5	V
CS-E5350	Industrial Internet Project	5-10	I-V
CS-C3170	Web Software Development	5	II-III
CS-E4400	Design of WWW Services	5	I-II
CS-E4420	Information Retrieval	5	III-IV

Knowledge and Business Networks

Professor in charge: Matti Vartiainen

Professors: Eila Järvenpää, Markku Maula, Kari Tanskanen, Riitta Smeds

Extent: 20-30 ECTS

The studies in the Knowledge and Business networks track focus on managing business networks, knowledge and innovation, and collaboration and leadership especially in knowledge-intensive networks. The studies combine in a novel way the studies offered by the Department of Industrial Engineering and Management focusing especially on networks from management, development and leadership point of views for value creation especially in ICT enabled business ecosystems. The studies provide the students with a broad understanding on networks and networking in different contexts, such as creation and developing business and organizations, creating new knowledge or developing organizational processes in collaboration.

Objectives

After completing the compulsory and elective studies of the track the students are able to

- create and renew networked business
- analyze and develop networked knowledge and organizational processes
- apply collaborative methods for developing business, organizations, work, and knowledge processes
- understand the relationship between people and ICT in networked business ecosystems

Content and structure

The Knowledge and Business Networks track includes selected courses of Industrial Engineering and Management. To complete the track the student selects at least one course from each topic (Managing business networks, Knowledge and innovation, and Collaboration and leadership, and completes the track with courses from this track so that the required amount of the credits is fulfilled.

The students taking the Knowledge and business networks track need to conduct technical studies (minimum of 20 credits) which can be completed either as a part of the major, as a minor or be placed in elective studies. Technical studies as minor studies can be from Aalto University technical schools (or equivalent technical studies from other universities).

Table 3. Knowledge and Business Networks track content.

CODE	NAME	CREDITS	PERIOD	YEAR
MANAGING BUSINESS NETWORKS (CHOOSE AT LEAST 1 COURSE)				
TU-E1010	Advanced Strategic Management	5	I	1.
TU-E1120	Strategic Management of Technology and Innovation	5	III-V	1.
TU-E1020	Strategies for Growth and Renewal	3	III-IV	1.
TU-E6110	Management of Networked Business Processes	3-5	I-II	1.
TU-L2040	Research Perspectives on Inter-organizational Collaboration	5	I-II	2.
TU-E2011	Industrial Service Operations	5	III-IV	1.
TU-E2030	Advanced Project-based Management	3-5	I-II	1.
TU-E6140	Yrityspeli	3	I, II, III, IV, V	2.
KNOWLEDGE AND INNOVATION (CHOOSE AT LEAST 1 COURSE)				
TU-E4040	Opportunity Prototyping	3	I	1.
TU-E4060	Design & Innovation in Context	6	II	1.
TU-E6120	Co-Development Interventions in Business Networks	5	III-IV	1.
TU-E3020	Knowledge Management in Practice	5	I-II	1.
TU-E2110	Innovation in Operations and Services	3-5	III-IV	1.
TU-E3130	Luovan ongelmanratkaisun seminaari V	5-8	I-II	1.

COLLABORATION AND LEADERSHIP (CHOOSE AT LEAST 1 COURSE)

TU-E6130	Facilitating Collaboration in Networks	5	I-V	2.
TU-E3030	Collaboration in Networks	5	I-II	1.
TU-E3010	Leading as Practice	5	III-V	1.
TU-E3040	Human Potential	5	III-IV	1.
TU-E4050	Entrepreneurial Leadership	5	III	1.
TU-L2010	Videoanalyysi organisaatioiden yhteiskehittämisen tutkimuksessa	5	I-II	2.

Media

Professor in charge: Tapio Takala

Extent: 20-30 ECTS

Objectives

The media track supports students to understand and create digital media products ranging from communication platforms to information visualization tools. Students learn basics of handling images, audio and video interactively on the web. This weaved together with strong understanding about software and content production processes gives students of the media track a unique set of skills.

Learning of conceptual solutions for social phenomena employing crowdsourcing, co-creation and sharing prepares students to create novel services. Technical capabilities enable implementation of media products for the networked world. World-class teaching on information visualization, computer graphics, gamification and sound design is combined in the media track with learning about storytelling and experimental user interfaces. This facilitates to face the challenges of Big Data for achieving true information usability both online and for individual organizations.

Students learn via collaborative work to act as in different roles of producers and clients of media production platforms. As a core part of the track is to learn creation and design of media and service concepts. Via experimental projects and prototyping the goal is to learn essential applications of emerging new media like augmented reality, large-scale screens, smart spaces, wearable devices and interactive animations.

Learning Outcomes

After completing the compulsory and elective studies of the Media track the students

- Understand and are able to apply novel and emerging media technologies
- Have skills to produce and develop media platforms and online services for content management and delivery

- Can manage concept design and software development processes for creation of media products

Content and structure

The Media track includes selected courses from Media Technology, Software and Service Engineering and Computer Science.

Table 4. Media track content. *If some of the compulsory courses are already included in your Bachelor's degree, select courses from the optional courses so that the minimum size of the track is fulfilled.

CODE	NAME	CREDITS	PERIOD	YEAR
COMPULSORY COURSES (14-23 ECTS*)				
CS-E4450	Explorative Information Visualization	5	I-II	1.
CS-E4400	Design of WWW Services	5	I-II	1.
DOM-E5038	Generative and Interactive Narratives	3	III-IV	2.
CS-E4002	Special Course in Computer Science**	1-10		2.

**Student conducts a special project on content production or multimedia. Project work should be agreed on beforehand with the responsible professor of the Media track.

CODE	NAME	CREDITS	PERIOD	YEAR
OPTIONAL COURSES				
CS-E5220	User Interface Construction	5	II	
CS-C3100	Computer Graphics	5	I-II	
ARTS-A0909	The Science of Storytelling: Narrative in Short Film Scripts	5	III-IV	
CS-E4410	Semantic Web	5	III-V	
CS-E4420	Information Retrieval	5	III-IV	
CS-E4200	Emergent User Interfaces	5	III-IV	

User-Centred Design

Professor in charge: Marko Nieminen

Professors: Tapio Takala, David McGookin, Lauri Savioja, Perttu Hämäläinen

Extent: 20-30 ECTS

Objectives

Digital services, software, and applications form an integral part of modern everyday life both in working surroundings and in leisure time contexts. Software in large government organisations is being used by employees who perform a multitude of tasks. Tiny mobile games are developed for entertaining people. In both cases, users are in a central position for the creation of successful results. In the "user-centred design" track students learn concepts, models, methods, procedures, and processes that can be applied in the design and development of systems and services so that the

outcomes not only fit users' needs, expectations, and contexts but also deliver excellent user experience.

Core contents of the user-centred design track include the conceptual and methodological basis for working with users in different stages of software and service development. A typical characteristic of contemporary software and service design is its multi-disciplinarity. Users and developers with varying backgrounds create novel, innovative, and efficient concepts and realisations in a collaborative manner. The user-centred methods and tools support these joint design and evaluation activities.

In the real-life-connected study assignments students of user-centred design learn how to analyse user contexts, form user requirements, do interaction design, develop user interfaces, evaluate the usability of a system, and connect these to business goals. They learn how to use qualitative and quantitative data and results in decision making. After completing their studies, students often work in technology companies as user interface and interaction designers, UX managers, software developers, and project managers.

Content and structure

The user-centred design track gives students the opportunity to become interaction design and user experience experts in industry. The long major lays a proper foundation for doctoral studies in the field. Students of the long major have the possibility to tailor the major personally in collaboration with their supervising professor.

Table 5. User-Centred Design track content. If any of these courses have been taken as part of the B.Sc. studies, they can be substituted with any optional courses of the major or the track the student is studying. In the case the student has taken similar courses at another institution, the professor should be contacted for discussing possible substitutions.

CODE	NAME	CREDITS	PERIOD	YEAR
COMPULSORY COURSES OF THE TRACK (15 CR*)				
CS-E4900	User-centred methods for product and service design	5	I-II	1.
CS-E5200	Design project	10	III-IV	1.
OPTIONAL COURSES OF THE TRACK (CHOOSE AT LEAST 5 CR)				
CS-E5210	Usability evaluation	5	IV-V	
CS-E5220	User interface construction	5	II	
CS-E5000	Seminar in Software and Service Engineering	5	I-V	
CS-E5002	Special Course in Software and Service Engineering	1-10		
CS-E4940	Requirements Engineering	5	III-V	
CS-E4910	Software Project 3	5-8	I-V	
CS-E4200	Emergent User Interfaces	5	III-IV	
CS-C2000	Ihminen havaitsijana	5	III-IV	
ELEC-E7851	Computational User Interface Design	5	II	
ELEC-E7860	Research Project in User Interfaces	5-10	III-V	
TU-C1010	Ihminen ryhmässä	5	I-II	