



AALBORG UNIVERSITY
DENMARK

The Technical Faculty of IT and Design
The Study Board for Media Technology

Curriculum for the Bachelor's Programme in Medialogy

Aalborg University

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Preface:

Pursuant to Act 261 of March 18, 2015 on Universities (the University Act) with subsequent changes, the following curriculum for the Bachelor's Programme in Medialogy is established. The Programme also follows the Joint Programme Regulations and the Examination Policies and Procedures for The Technical Faculty of IT and Design, The Faculty of Engineering and Science, and The Faculty of Medicine.

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Chapter 1: Legal Basis of the Curriculum, etc.

1.1 Basis in ministerial orders

The Bachelor's Programme in Medialogy is organised in accordance with the Ministry of Higher Education and Science's Order no. 1328 of November 15, 2016 on Bachelor's and Master's Programmes at Universities (the Ministerial Order of the Study Programmes) and Ministerial Order no. 1062 of June 30, 2016 on University Examinations (the Examination Order). Further reference is made to Ministerial Order no. 257 of March 18, 2015 (the Admission Order) and Ministerial Order no. 114 of February 13, 2015 (the Grading Scale Order) with subsequent changes.

1.2 Faculty affiliation

The Bachelor's Programme falls under The Technical Faculty of IT and Design, Aalborg University.

1.3 Study Board affiliation

The Bachelor's Programme falls under the Study Board for Media Technology at School of Information and Communication Technology.

1.4 Body of External Examiners

The Bachelor's Programme in Medialogy is associated with the Body of External Examiners for Engineers (Ingeniørernes landsdækkende censorcorps, elektronik-delen).

Chapter 2: Admission, Degree Designation, Programme Duration and Competence Profile

2.1 Admission

Admission to the Bachelor's Programme in Medialogy requires an upper secondary education.

The Programme's specific entry requirements are:

- English B *or* an acceptable IELTS test score
- Mathematics B or better (or equivalent level or better from foreign upper secondary institutions)

cf. the Admission Order.

The University can stipulate requirements concerning conducting additional exams prior to the start of study.

2.2 Degree designation in Danish and English

The Bachelor's Programme entitles the graduate to the designation:

- Bachelor (BSc) i medialogi. The English designation is: Bachelor of Science (BSc) in Medialogy.

2.3 The Programme's specification in ECTS credits

The Bachelor's Programme is a 3-year, research-based, full-time study programme. The Programme is set to 180 ECTS credits.

2.4 Competence profile on the diploma

The following will appear on the diploma:

- A graduate of the Bachelor's Programme has competences acquired through an educational Programme that has taken place in a research environment.
A graduate of the Bachelor's Programme has fundamental knowledge of and insight into his/her subject's methods and scientific foundation. These properties qualify the graduate of the Bachelor's Programme for further education in a relevant Master's Programme as well as for employment on the basis of the educational Programme.

2.5 Competence profile of the Programme

Students who complete the Bachelor's Programme in Medialogy will obtain the following qualifications:

Knowledge	<ul style="list-style-type: none">• Understanding of the basic function of the human senses, and their interaction, as they function in the perception of the surroundings in general and media in particular• Understanding of the duality between, on the one hand, computer-based recording and analysis of digital signals, and on the other, computer-based generation/synthesis and presentation of the corresponding signals• Understanding of the interactive processes between humans, computers and machines• Understanding of the structures of narrative forms and dissemination in relation to media and media technology characteristics, and understanding of the interplay between form and content regarding media and media technologies• Understanding of media history, including cultural, ethnographical, social and sociological perspectives of media• Understanding of media technological theories and methods, and of their respective foundations and validity areas. This concerns core media technological areas such as audio processing/analysis, image processing/analysis, computer graphics modelling/animation and rendering, computer games and virtual reality• Understanding of aspects of programming, from control structures to design patterns and communication protocols
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Skills	<ul style="list-style-type: none"> • Ability to identify, phrase and operationalize constraints on a media technological system, taking into account the aim of the system, the users and the technological affordances • Ability to analyse and evaluate the validity, applicability and performance of media technological solutions in the context of a given problem domain • Ability to apply state-of-the-art media technologies in designing and implementing interactive systems • Ability to synthesize complex systems from existing elements, and/or to synthesize new functionality, methodology or knowledge regarding sub-systems • Ability to design evaluations of, and to evaluate, media technological systems in relation of identified metrics and goals • Ability to communicate analyses, designs, implementations, and evaluations to peers orally, and in various forms of writing
Competences	<ul style="list-style-type: none"> • Ability to apply acquired skills to working independently in teams of peers and/or in interdisciplinary teams • Ability to identify own and well as group-related learning needs • Ability to independently acquire knowledge and connect new knowledge with existing knowledge and critically assess both • Ability to clearly and structurally disseminate relevant information, taking into account the target audience and show an alert and attentive attitude to other participants • Ability to define and respect own, and possibly also other participants', function compared to the whole – that is both to lead and be guided • Able to contribute to the joint development of knowledge and experience formation

Chapter 3: Content and Organization of the Programme

The Programme is structured in modules and organized as a problem-based study. A module is a Programme element or a group of Programme elements, which aims to give students a set of professional skills within a fixed time frame specified in ECTS credits, and concluding with one or more examinations within specific exam periods. The examinations are defined in the curriculum.

The Programme is based on a combination of academic, problem-oriented and interdisciplinary approaches and organized based on the following work and evaluation methods that combine skills and reflection:

- lectures
- classroom instruction
- project work
- workshops
- exercises (individually and in groups)
- project work and exercises in labs
- teacher feedback
- reflection
- portfolio work

The BSc education in Medialogy is taught in English. All activities, including the above stated, are carried out in English. All exercise work and deliverables, project-work (as well as any documentation in connection to these) delivered by the student must be written in English and all exams are carried out in English. In accordance with the current Joint Programme Regulations, The Study Board for Media Technology may choose to exempt from this rule in extra-ordinary cases, which in principle requires a well-documented application from the student and/or teacher.

Overview of the Programme:

All modules are assessed through individual grading according to the 7-point scale or Pass/Fail. All modules are assessed by external examination (external grading) or internal examination (internal grading or assessment by the supervisor only).

Semester 1: Designing from Both Sides of the Screen					
Semester	Module	ECTS	Assessment	Exam	Type
1st	Commencement of Studies Exam	0	Pass/Fail	Internal	Mandatory
1st	Creative Play - Applied Technology	5	Pass/Fail	Internal	Mandatory
1st	Designing from Both Sides of the Screen	10	7-point scale	Internal	Mandatory
1st	Audio-Visual Sketching	5	7-point scale	Internal	Mandatory
1st	Introduction to Programming	5	7-point scale	Internal	Mandatory
1st	Problem Based Learning in Science, Technology and Society	5	Pass/Fail	Internal	Mandatory
Semester 2: Interaction Design					
Semester	Module	ECTS	Assessment	Exam	Type
2nd	Human-Computer Interaction	15	7-point scale	External	Mandatory
2nd	Interaction Design	5	7-point scale	Internal	Mandatory
2nd	Mathematics for Multimedia Applications	5	7-point scale	Internal	Mandatory
2nd	Programming for Interaction	5	7-point scale	Internal	Mandatory
Semester 3: Visual Computing – Human Perception					
Semester	Module	ECTS	Assessment	Exam	Type
3rd	Visual Computing-Human Perception	15	7-point scale	External	Mandatory
3rd	Image Processing	5	7-point scale	Internal	Mandatory
3rd	Human Senses and Perception	5	7-point scale	Internal	Mandatory
3rd	Programming of Complex Software Systems	5	7-point scale	Internal	Mandatory
Semester 4: Sound Computing and Sensor Technology					
Semester	Module	ECTS	Assessment	Exam	Type

4th	Sound Computing and Sensor Technology	15	7-point scale	Internal	Mandatory
4th	Audio Processing	5	7-point scale	Internal	Mandatory
4th	Design and Analysis of Experiments	5	7-point scale	Internal	Mandatory
4th	Physical Interface Design	5	7-point scale	Internal	Mandatory
Semester 5: Audio-Visual Experiments					
Semester	Module	ECTS	Assessment	Exam	Type
5th	Audio-Visual Experiments	15	7-point scale	External	Mandatory
5th	Computer Graphics Programming	5	7-point scale	Internal	Mandatory
5th	Rendering and Animation Techniques	5	7-point scale	Internal	Mandatory
5th	Screen Media	5	Pass/Fail	Internal	Mandatory
Semester 6: Interactive Systems Design					
Semester	Module	ECTS	Assessment	Exam	Type
6 th	BSc Project (Interactive Systems Design)	15	7-point scale	External	Mandatory
6 th	Artificial Intelligence Programming	5	7-point scale	Internal	Elective
6 th	Ethnographically Informed Design	5	7-point scale	Internal	Elective
6 th	Real-time Interfaces and Interactions	5	7-point scale	Internal	Elective
6 th	Theory and Practice of Game Design and Development	5	7-point scale	Internal	Elective
6 th	Technologies for Web and Social Media	5	7-point scale	Internal	Elective
	Total	180			

On the 6th semester students must choose 3 out of 5 elective courses (15 ECTS in total).

The Medialogy curriculum includes exposure to theories of science, scientific theories and methods in a range of ways. General theory of science, scientific theory and scientific methods are introduced in the course Problem Based learning in Science, Technology and Society. Furthermore, most courses introduce theories of science, scientific methods and scientific theories, which are specific to the topic of the courses, and place this in the context of the overall education. Lastly, the students develop their skills in this area in their project work, where they will apply scientific methods in practice and reflect on their applicability in the subsequent process and project evaluation.

3.1 1st semester

Title: Commencement of Studies Exam (Studiestartsprøve)
Size: 0 ECTS
<p>The purpose of the commencement of studies exam is to ascertain whether students have actually commenced their studies. The students must participate in and pass the commencement of studies exam in order to continue on their studies. If the commencement of studies exam is not passed, the students will be discharged from their studies by October 1st.</p> <p>Content:</p> <p>The commencement of studies exam is a written exam based on the instruction and/or the intro course as well as the students' expectations and motivation for the studies.</p> <p>It will be possible to assess whether the students have actually commenced their studies based on their answers.</p> <p>The students receive the assessment "Approved" or "Not approved" based on their answers on the written exam. The assessment "Approved" is received when the written exam is answered and handed in.</p> <p>Re-exam:</p> <p>If the students do not participate in or do not pass the commencement of studies exam, the students must participate in and pass the re-exam which is also a written exam. The students must participate in and pass the re-exam in order to continue on their studies.</p> <p>If the students do not participate in or do not pass the re-exam, and do the students not have special circumstances that may grant exemption, the students will be discharged from their studies without further notice by October 1st.</p> <p>Timing of the examination:</p> <p>The commencement of studies exam will be held in the semester's first instruction week.</p> <p>The re-exam will be held in the semester's second instruction week.</p> <p>Complaints:</p> <p>The students can not complain about the commencement of studies exam, unless the complaint regards legal issues.</p>

<p>Title: Creative Play – Applied Technology (Kreativ leg – teknologisk udformning)</p>
<p>Size: 5 ECTS</p>
<p>Objectives: Students who complete the project module will be able to demonstrate preliminary learning outcomes for advancing as a student. Expectations are that the student can design, partly implement and assess the development of a media oriented work, such as a poster, computer game, interactive homepage, etc.</p> <p>Students who complete the project module will be able to:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> ● Explain problem-based study and the Aalborg model of PO PBL (understanding) ● Name prerequisites of group work ethics and organization (knowledge) ● Describe typical work processes in a problem based project related to Media Technology (knowledge) ● Describe individual as well as organizational learning processes (knowledge) <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> ● Organize a short period of collaboration in-group and with a supervisor (application) ● Apply basic principles of scientific work and academic honesty including plagiarism rules and proper citations ● Apply taught methods to conceptualize, plan and organize own learning and knowledge sharing in a group situation ● Demonstrate basic analysis of media-oriented work (analysis) ● Evaluate practical problems and select relevant solutions in a media oriented context ● Formulate basic reflections and results of the problem based project work: orally, graphically and in writing (synthesis) <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> ● Take independent responsibility of one's own learning during a shorter project period (application)
<p>Type of instruction: Academically supervised student-governed problem oriented project work.</p>
<p>Exam format: Oral group examination with internal censor based on a written project report and a media-technological product plus a written process analysis. The Study Board for Media Technology may decide or exempt that only a technical artifact with documentation can be the basis for the individual oral examination. Furthermore, The Study Board for Media Technology may decide or exempt from the demand for a process analysis.</p> <p>The assessment is performed with the Pass/Fail grade.</p>
<p>Evaluation criteria: The criteria for the evaluation are specified in the Joint Programme Regulations.</p>

<p>Title: Designing from Both Sides of the Screen (Design fra begge sider af skærmen)</p>
<p>Size: 10 ECTS</p>
<p>Prerequisites: The module adds to the knowledge obtained in the Creative Play – Applied Technology (Kreativ leg - teknologisk udformning)</p>
<p>Objectives: To provide the student with practical experience defining a project within the area of information technology, communication and new media, which includes use of programming, to implement the project by working in groups and to document the solution in a project report.</p> <p>Students who complete the project module will be able to:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Explain basic theory, methods and practices used in media technology that relate to the project (understanding) • Describe basic concepts of problem-based study and the Aalborg model of PO PBL (knowledge) <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Compose a problem formulation from a larger problem area that can be answered or addressed within the scope of the project (synthesis) • Understand how the target group from the problem formulation interacts in a real world context of use with similar media products or artifacts, which address the initial problem formulation • Apply scientific theory and methods in a media technology oriented project and discuss basic reflections on their use in the project (analysis) • Apply a Programming language and implement parts of Programmes or small Programmes in order to solve a specific problem • Carry out a basic evaluation of an artifact with the target user group (ideally not a convenience sample) or domain experts (application) • Relate findings from the evaluation to a wider context (analysis) and apply knowledge from the field of Science, Technology and Society (STS) to identify relevant contextual perspectives (understanding) • Organize and communicate the reflections and results of the problem based project work; orally, graphically and in writing – for the latter by applying a provided template or creating their own version of it (understanding) • Organize and manage a longer-term project considering group and supervisor collaboration (application) • Analyse the process involved in carrying out the project from a project management point of view and reflect on individual as well as group learning (analysis) <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Use proper terminology to discuss the project and Media Technology related aspects thereof (understanding) • Take responsibility of one's own learning during a 2-3 month project period and generalize the gained experiences (synthesis)
<p>Type of instruction: Academically supervised student-governed problem oriented project work.</p>

Furthermore the Study Board for Media Technology wishes to note for implementation:

- 1) Students have to prepare a written P1 process analysis
- 2) Students will get support to identify relevant contextual perspectives by receiving comments on papers and feedback at group meetings.
- 3) Students will get support to transfer project management theory to the projects by a PBL-seminar and related to this comments on papers as well as presentations in order to secure action on a mid-term process-analysis
- 4) A written comment to the group's process analysis will be provided to support project-examination

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

Oral group examination with internal censor based on a written project report, evidence of design activities and their evolution (e.g., through sketchbooks, log books or a portfolio) and a media-technological product plus an A/V production that illustrates and summarizes the project plus a written process analysis.

The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Audio-Visual Sketching (Audio-Visual Sketching)</p>
<p>Size: 5 ECTS</p>
<p>Objectives: Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Understanding the fundamentals of camera usage and how it correlates with virtual cameras in 3D modelling software • Understanding the fundamental principles of lighting a scene, both actual and in a virtual 3D environment • Knowledge of the fundamentals of 3D modelling and compositing • Knowledge about basic 2D and 3D animation principles, history, theories and techniques • Understanding the concept and practice of key framing and in-betweens in animation • Knowledge of how to combine virtual and physical objects in an animated sequence • Understanding A/V and film techniques, such as editing, framing, image composition, types of shots, camera movement, focus, etc. • Knowledge of basic sound-recording and –production, including knowledge about microphone types • Knowledge of fundamental storytelling and storyboarding techniques in animation and A/V-productions • Knowledge of the production pipeline in animation and A/V productions • Understanding of sketching of objects, characters and storyboards and modelling of physical objects • Knowledge of physical prototyping, including knowledge of preparing 3D models for 3D printing <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Apply knowledge of sketching of objects, characters and storyboards and physical modelling for prototypes, animatics and pre-visualizations • Apply the fundamentals of key framing to create traditional animation • Apply knowledge about 3D design, modelling, animation, and lighting to render a computer animated 3D scene • Apply knowledge about principles and theories of traditional and 3D animation techniques, A/V-production theories and compositing to produce a short A/V production <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Knowledge of fundamentals of software applications within 3D modelling, animation and A/V-production • Apply camera and storytelling techniques in a production • Analyse and apply basic lighting set-ups and compositing techniques, e.g., green screen • Evaluate the use of techniques and principles in A/V productions
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.</p>

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in. If the student hands in a paper/exercise after the deadline, the student has used an examination attempt.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Introduction to Programmemeing (Grundlæggende programmering)</p>
<p>Size: 5 ECTS</p>
<p>Objectives: Students who complete the module obtain a solid foundation in working with computers and other digital devices, which will be built upon in future coursework to enable programming for different media platforms and working with analogue and digital sensors. Furthermore, the student will be provided with a foundation and basic introduction to the systematic development of programmes. The student should acquire an understanding of basic concepts and mechanisms in an imperative programming language such that the student is able to use the language and associated library to implement small programmes.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Understanding of control flow structures, both branching (e.g., if, switch), and loops (e.g., for, while) • Understanding variables, data types and structures (e.g., arrays, structs) • Understanding functions including function parameters, function output, and recursion • Understanding of design methodologies for programming and understanding of the distinction between good and bad programming practices • Understanding top-down and bottom-up problem solving strategies. • Understanding of the basic architecture and terminology related to computers (CPU, RAM, hard drive, I/O devices) • Understanding of basic terminology related to information storage and processing (bits, bytes, binary and hexadecimal numbers, floating point numbers, 2's complement) • Understanding of the basic steps of producing a runnable Programme using an integrated development environment (IDE) (writing code, compiling, linking, debugging) • Understanding of the basic steps of converting mathematical expressions into code (e.g., basic trigonometric functions and vector arithmetic) • Understanding of the basic 2-D geometry needed to produce interactive 2-D graphics, e.g., vector arithmetic and trigonometric functions <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Ability to apply knowledge to the design of a simple event-driven interactive interface, e.g., a simple game • Ability to interpret and analyse programming code • Ability to apply programming skills to the implementation of input devices, e.g., keyboard, mouse • Ability to apply programming skills to the design and implementation of basic functions and data structures • Make use of built-in API functions and data types in synthesising new programs (application) • Ability to apply knowledge to the systematic design of software with proper documentation • Must be able to plan and perform systematic test of small Programmes (e.g., black box and white box testing approaches) (application) • Ability to apply programming skills to the implementation of basic mathematical expres-

sions needed to create interactive 2D graphics

- Must be able to discuss/assess the quality of a given Programme (**analysis**)
- Must be able to use an IDE for software development, including a debugger (**application**)

Competencies

- **Evaluate** existing code, judge its design, and recommend changes
- Must have competencies in using programming to solve programming tasks, especially programming tasks related to medialogy, communication and IT/new media (**application**)

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in. If the student hands in a paper/exercise after the deadline, the student has used an examination attempt.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Problem Based Learning in Science, Technology and Society (Problembaseret læring i videnskab, teknologi og samfund)</p>
<p>Size: 5 ECTS</p>
<p>Objectives: The students shall theoretically as well as practically understand how to plan and carry out a basic scientific problem-based project with technological, social and humanistic relevance. This includes an understanding of how technological aspects and contextual circumstances can be identified and included in the development of a problem solution.</p> <p>Students who complete the project module will be able to:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Must have knowledge of basic learning theories • Must have knowledge of project planning and management techniques • Must have knowledge of different approaches of problem based learning (PBL) including the Aalborg model of PO PBL • Must have knowledge about the history of media and its social-cultural context/application • Must have knowledge about what a technology is, including how it can be assessed in a larger context, e.g., using technology assessment techniques • Must be able to describe fundamental concepts regarding creativity and relate them to creative methods applied in a problem solving context <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Must be able to apply basic principles and study techniques related to planning and management of a problem-based project; especially including phases in a problem-oriented project, from initial problem to problem analysis and problem formulation, design, implementation and evaluation • Must be able to analyse and evaluate the organisation of the project group work, identifying strong and weak factors within, e.g., group dynamics, team roles, internal/external communication and time management; reflecting on improvements for future situations and documenting the applied methods for the analysis (application) • Must be able to analyse group conflicts: causes and possible solutions (application) • Must be able to analyse and evaluate own contribution to studying and learning, e.g., by identifying continuous course of events influencing own learning, reflecting on how these events form the learning processes, learning style and the personal study experience (application) • Must be able to apply basic methods for analysis and evaluation of a Medialogy-problem from a scientific, ethical, technological and societal perspective • Must be able to apply basic creative design methods for problem solving tasks, especially considering wider contexts, e.g., assessing life styles, consumption, communication and common practices <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Must be able to apply knowledge (application) and understanding regarding being part of a team-based project work • Must be able to understand and communicate project work (application) • Must be able to analyse own learning processes • Must be able to analyse and document learning processes within the group • Must be able to establish optimal collaborative learning processes (application)

- Must be able to apply knowledge and understanding of science, technology and society (**application**) from a technological and holistic perspective
- Must be able to **understand** basic methodological strategies for evaluating Medialogy problems (e.g., applying concepts from Theory of Science for evaluating projects)

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the

Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in. If the student hands in a paper/exercise after the deadline, the student has used an examination attempt.

Individual oral or written examination with internal censor. The assessment is performed with the Pass/Fail grade.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

3.2 2nd semester

Title: Human-Computer Interaction (Menneske-computer interaktion)
Size: 15 ECTS
Prerequisites: The module adds to the knowledge obtained in 1 st semester
Objectives: After completing the project module the student shall be able to demonstrate knowledge, skills and competencies in how to design, develop and evaluate an artefact, such as a desktop or a mobile application, using a user-centred approach. The students shall develop their theoretical and methodological skills by designing an application complete with a user interface. They shall examine new modalities for individual and/or group perception, action and experience. With the aim of delivering unified experiences and/or new forms of perception/action, the students foster key competences in using development and design processes for creating media-technological artefacts and in working with requirements specifications developed from user needs. While pursuing this aim, they will be able to apply their knowledge and skills in mathematics, programming and interaction design. As specified by the Study Board for Media Technology, a sub-theme description is formulated in connection with the project. In connection with the project a minimum of five related seminars /lectures are offered. Students who complete the project module will be able to: Knowledge <ul style="list-style-type: none">• Describe new forms of interaction with the real world, data sources, and/or physical/virtual models (understanding)• Explain how human computer confluence can enhance the foundations for future applications of societal value (understanding)• Explain the methods for planning and developing an IT application (understanding)• Explain the iterative nature of interaction design (understanding) Skills <ul style="list-style-type: none">• Apply a human centred design approach in the context of use, design, development and evaluation of a new interface (understanding)• Design, plan, organize and conduct a user needs study of a target group (synthesis)• Analyse how a chosen target group interacts in a real world context of use with similar media products or artefacts and apply this to novel designs through, e.g., scenarios and storyboards, and later with early prototypes• Apply methods, tools and theories to allow people to explore and augment human interaction capabilities and awareness in action and interaction• Synthesise technical requirement specifications as a basis for developing a media technology project• Design and implement a simple artefact based on fundamental object-oriented Programming (OOP) strategies, models and development environments (application)• Prepare and perform standardized testing of an artefact with the target user group (not a convenience sample) or domain experts and analyse and discuss the findings (application)

Competencies

- **Apply** the gained experiences with project management to the future course of study (**evaluation**)
- **Evaluate** the ethical perspective of engineering and science and discuss implications of a responsible professional practice (**analysis**)
- Explain basic quantitative results with descriptive statistics in writing and in figures (**application**)

Type of instruction:

Academically supervised student-governed problem oriented project work.

Furthermore the Study Board for Media Technology wishes to note for implementation that the students will get support to identify, analyse and assess relevant contextual perspectives by attending "Problem Based Learning in Science, Technology and Society" (STS) seminars, receiving comments on papers and feedback at group meetings. This will be facilitated or achieved through co-supervision from STS experts.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

Oral group examination with external censor based on:

- a written project report
- a media-technological artefact
- evidence of design activities and their evolution (e.g., sketchbooks or portfolios)
- a written P2 process analysis
- an A/V production that illustrates and summarizes the project

The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Interaction Design (Interaktionsdesign)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to the knowledge obtained in the 1st semester.</p>
<p>Objectives: The objective of the course is to provide the students with an understanding of the theories and methods of interaction and graphics design and the ability to apply these theories and methods for concrete design problems.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Must have knowledge and understanding of interaction design basics, different interaction models and user input/output modalities and their interplay • Must have knowledge about iterative process of interaction design and user centred methods for design • Methods for user tests (application) • Must have an understanding about conceptualizing interaction • The use of conceptual modelling (e.g., mental models) in design (application) • Must have knowledge about the use of storyboards and scenarios • Must have knowledge about the basics of qualitative and quantitative data gathering, analysis and interpretation • Must have understanding of designing interfaces which go beyond the traditional graphical user interfaces, such as physical and mobile computing • Must have understanding about the concept of designing and building lo-fi and hi-fi prototypes as an integral part of the iterative design process and to evaluate these in user tests • Must have understanding of usability test design including establishing goals and measures such as user friendliness, learnability, likeability, sociability, playability, accuracy, speed, etc., for empirical and theoretical methods • Must have knowledge about the basic theory of Graphical User Interfaces (GUIs), including graphic design and aesthetics • Must have understanding of the visual relationships in a composition of GUIs and images • Must have knowledge about the state-of-the-art techniques used in graphic design for human-computer interaction <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Must have ability to apply a qualitative approach (e.g., interviewing, contextual inquiry, etc.) to elicit user needs, preferences and capabilities in a real world context, analyse and explain the findings (understanding) • Design (apply) solutions to interaction design related problems • Understanding and applying how to perform user evaluations, and present basic quantitative results using descriptive statistics in writing and figures • Ability to demonstrate (application) the concept behind the interface design through conceptual models • Must be able to understand, evaluate and apply different graphical communication forms such as typefaces, shapes, contrasts, colors, balance, proportion and flow

Competencies

- **Analyse** needs of different target groups
- **Compare** different user-centred evaluation methods, on a level to decide which of them are applicable and suitable for certain evaluations
- **Apply** and **evaluate** user-centred evaluation methods
- **Apply** the iterative method for interaction design
- **Apply** graphical design principles in interaction design

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in. If the student hands in a paper/exercise after the deadline, the student has used an examination attempt.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Mathematics for Multimedia Applications (Matematik til multimedie-applikationer)</p>
<p>Size: 5 ECTS</p>
<p>Objectives: Introduction of the mathematics needed for media technology applications.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Understand trigonometric functions and identities • Understand logarithmic and exponential functions • Understand differentiation and integration of functions of one variable, including numerical methods • Understand vectors and basic vector operations, dot product and cross product • Understand basic geometry in 2 and 3 dimensions: points and distance; lines, planes, spheres and their intersections • Understand parametric curves: position, velocity and acceleration • Understand matrices, basic matrix operations and linear transformations • Understand systems of linear equations • Understand matrix inversion • Understand the relevance and application of mathematics to modeling and understanding systems and phenomenon <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Ability to perform basic algebraic calculations (application) • Ability to work with trigonometric, logarithmic and exponential functions (application) • Ability to calculate derivatives of functions of one variable (application) • Ability to calculate integrals of functions of one variable (application) • Ability to perform calculations involving vectors, vector operations, matrices and matrix operations (application) • Ability to determine equations for lines, spheres and planes, to calculate intersections and find distances (application) • Ability to differentiate and integrate vector functions (application) • Ability to determine solvability and complete solutions for systems of linear equations (application) • Ability to determine the invertability of a small square matrix and its inverse if it exists (application).
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.</p>
<p>Exam format: In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:</p>

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in. If the student hands in a paper/exercise after the deadline, the student has used an examination attempt. Individual written examination with internal censor. The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Programming for Interaction (Programmering af interaktive systemer)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to the knowledge obtained in Introduction to Programming</p>
<p>Objectives: By completing the module, the students will be able to design, programme, and evaluate interactive applications both on the standard PC platform as well as mobile platforms. Furthermore, the module will seek to introduce basic concepts from object-oriented programming. The module covers the fundamentals of the programming of graphical user interfaces (GUIs) as well as interactions in mobile and pervasive environments that afford touch or sensor-based interaction. The objective is that the students acquire the knowledge, skills, and competencies required for the actual planning, implementing, code generation, and evaluation of interactive applications.</p> <p>Students who complete the project module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Knowledge of fundamental object-oriented programming (OOP) strategies and models used in software development • Knowledge of rich pictures and use case diagrams to facilitate a user centered design approach • Knowledge of mobile development environments, debugging tools and methods for evaluation of mobile applications • Understanding of basic design patterns relevant to mobile development (Model-View-Controller (MVC), singleton, etc.) • Knowledge of GUI programming on both PC and mobile platforms • Understanding the difference between sequential and event based programme structures (e.g., event listeners, call-back functions) • Understanding of working with files and file systems in programming • Understanding different development methods (e.g., Waterfall, Spiral, Agile) in relation to software development <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Ability to apply OOP in development and design of interactive applications. • Analyse, interpret and apply design patterns and basic models (entity-relationship diagrams, UI storyboards, or flowcharts, etc.) • Must be able to implement event based designs into functioning applications • Must be able to apply an object-oriented approach to software implementation • Must be able to implement an application with a GUI • Must be able to develop, deploy, and test an application on a mobile device such as a smart phone or tablet (application) <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Must be able to understand how to systematically design, programme, and evaluate interactive applications • Must be able to analyse the problem domain and user requirements • Must be able to synthesise the domain understanding into models (entity-relationship diagrams, UI storyboards, flowcharts, design patterns, etc.)

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in. If the student hands in a paper/exercise after the deadline, the student has used an examination attempt.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

3.3 3rd semester

Title:**Visual Computing-Human Perception**

(Visual Computing-Human Perception)

Size: 15 ECTS

Prerequisites:

The module adds to the knowledge obtained in 2nd Semester

Objectives:

One of the cornerstones in Medialogy is to build systems that automatically react to humans in ways that may or may not involve visual output. In this module the focus is on doing so using visual computing, i.e., automatically analysing visual information recorded by one or more cameras. For example, a computer game controlled by human movements or a dynamic art installation reacting to the constellation of people in an environment. Having humans as end-users also means a need to consider what we can and cannot perceive, and how we use perceptual information in relation to digital media application.

The students will work with a concrete problem where automatic analysis of visual data is central. The problem will be analysed and a concept for a solution suggested. The concept (or parts hereof) will be designed, implemented and evaluated using relevant theories and methods from the sub-fields of visual computing: image processing, programming and perception.

As specified by the Study Board for Media Technology, a sub-theme description is formulated in connection with the project. In connection with the project a minimum of five related seminars /lectures are offered.

Students who complete the project module will obtain the following qualifications:

Knowledge

- Must have **knowledge** about the terminology within visual computing
- Must be able to **understand** how a particular visual computing system, e.g., the semester project of the student, works
- Must be able to **understand** and compare a particular visual computing system, e.g., the semester project, to similar systems and to the surrounding society
- Must be able to **understand** and explain the mathematical fundamentals of visual computing

Skills

- Must be able to **analyse** a problem and (if possible) suggest a solution that uses relevant theories and methods from visual computing
- Must be able to **analyse** a system that is based on visual computing and identify relevant constraints and assessment criteria. This relates both to the usability of the system, the technical aspects of the system and (if relevant) the usefulness to society
- Must be able to design and implement (**apply**), a system (or parts hereof) using relevant theories and methods (if possible) from visual computing

- Must be able to test and evaluate (**analyse**) a visual computing system (or parts hereof) with respect to the aforementioned assessment criteria
- Must be able to communicate the above knowledge and skills (using proper terminology) both orally and in a written report

Competencies

- Must be able to discuss relevant theories and methods of visual computing and general theories on perception and **apply** to concrete problems and situations
- Must be able to **apply** current knowledge on human perception and visual computing in the evaluation of an implemented systems

Type of instruction:

Academically supervised student-governed problem oriented project work.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

Oral group examination with external censor based on:

- a written project report
- a media-technological artefact
- an A/V production that illustrates and summarizes the project

The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Image Processing (Billedbehandling)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to the knowledge obtained in Mathematics for Multimedia Applications</p>
<p>Objectives: Cameras capture visual data from the surrounding world. Building systems which can automatically process such data requires image processing methods. Students who complete the module will understand the nature of digital images and have an overview of different theories and methods within image processing and their applicability.</p> <p>Students who complete the project module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Must have knowledge about basic and linear algebra • Must have knowledge about the primary parameters of the camera and lens • Must have knowledge about the representation of a digital image • Must be able to understand the general framework of image processing • Must be able to understand and interpret image histograms • Must be able to understand color images and their different representations • Must be able to understand the principle of point processing • Must be able to understand principle of neighborhood processing • Must be able to understand what a BLOB is and how it can be extracted • Must be able to understand how moving objects can be segmented in a video sequence <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Must be able to apply matrix calculations • Must be able to apply the following point processing methods: grey-level mapping, histogram stretching, thresholding and image arithmetic • Must be able to apply the following neighborhood processing methods: median filter, mean filter and edge detection • Must be able to apply the following morphologic operations: dilation, erosion, opening and closing • Must be able to apply basic feature extraction and matching • Must be able to apply image differencing and background subtraction • Must be able to apply geometric transformations to an image • Must be able to apply convolution/correlation to an image by using the corresponding mathematical operation <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Must be able to apply the general framework of image processing in a new context. This includes choosing the relevant methods and evaluating the output

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor. The assessment is performed with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Human Senses and Perception (Perception)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to the knowledge obtained in Interaction Design (2nd semester)</p>
<p>Objectives: We perceive and interpret the world around us using our senses. The same senses can also be deceived, often because we expect the world to look, sound or feel as we have been used to. Students who complete this module should be able to design systems that take advantage of the sensitivities and insensitivities of the human senses.</p> <p>Students who complete the project module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Must have knowledge of the basic physiology of the human senses (vision, hearing, touch and vestibular) • Must have knowledge about the sensitivity and limitations of the human senses (vision, hearing, touch and vestibular) • Must have knowledge about the basic principles of neural function and communication: neural firing, receptive fields and after-effects • Must be able to understand how objects and scenes are perceived • Must be able to understand attention theories • Must be able to understand motion perception theories • Must be able to understand frequency, amplitude, pitch, loudness and timbre of a sound • Must be able to understand masking effects • Must be able to understand Gestalt theories <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Must be able to apply a list of constraints with regards to human sensitivity when designing a media application: limits of audibility and visibility; latency vs. reaction times, etc. • Must be able to apply knowledge of sensitivity when assigning computational resources in the design of digital media applications <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Must be able to apply general theories on perception to concrete phenomena and situations • Must be able to apply current knowledge on human perception in the evaluation of systems, reflecting on what users can and cannot perceive • Must be able to apply theories on human perception and attention in designs that take the human user into account
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for</p>

this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Programmemeing of Complex Software Systems (Programmering af komplekse software-systemer)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to the knowledge obtained in Programming for Interaction and Introduction to Programming.</p>
<p>Objectives: Many real world software systems are complex, involving multiple devices, processors, users, and complex algorithms. To allow the students to work with such software systems, this module introduces several methods that are relevant when developing and using large software systems. The objective is to give the students an understanding of object-oriented software analysis and design methods. Furthermore, an introduction to network programming and parallel programming, data structures and algorithms is also given. Several of these aspects of the module can also support the Image Processing course running in parallel.</p> <p>Students who complete the project module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Understanding of the basic concepts of object-oriented design and analysis (e.g., encapsulation, inheritance, composition, association, interfaces) • Understanding of using the UML language to produce and communicate an object-oriented software design (structure, behaviour, and interaction diagrams) • Understanding of structure and tools for documenting codebases • Understanding of data structures used for search and sort algorithms (graphs, linked lists, queues, stacks, trees, heaps, hash tables) • Understanding of the concept of the complexity of an algorithm and big-O notation • Understanding of programming concepts related to networks: clients and servers, sockets, ports, IP address (static/dynamic), Ethernet address • Understanding digital application and communication protocols: the OSI model, TCP and UDP. • Understanding the concepts behind parallel programming: processes and threads, scheduling, bottlenecks and deadlocks, shared data, mutex locks, race conditions • Understanding of common versioning software practices and terminology <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Ability to both produce and understand UML-based diagrams in order to work with object-oriented design and analysis (application, analysis) • Ability to implement an object-oriented design from a UML description (application) • Ability to choose and apply appropriate data-structures to create efficient Programmes for searching and sorting • Ability to apply to design a fitting software solution both in the field of networking and multi-threaded programming • Ability to apply programming skills to implement a multithreaded Programme that uses the network to communicate between two digital devices (application) • Ability to use a commonly used software versioning system (application)

Competencies

- Produce and implement object-oriented software designs (**application**)
- Document an object-oriented software system using UML (**application**)
- **Evaluate** existing code in the fields of network and multithreading, judge its design and recommend changes
- Must have competencies in designing efficient solutions using advanced data structures to solve programming tasks, especially programming tasks related to medialogy, communication and IT/new media (**application**)
- Read and design algorithms and **analyse** their complexity

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

3.4 4th semester

Title: Sound Computing and Sensor Technology (Lyd- og sensorteknologi)
Size: 15 ECTS
Prerequisites: The module adds to the knowledge obtained in 3 rd semester
Objectives: Hearing is one of the fundamental senses of the human perceptual system. Being able to understand how auditory signals are created and how they can be used as input or output devices in solving problems in interactive media is an essential element of the Medialogy Programme. In this semester project, students pose problems that include the design and implementation of computer systems being able either to analyse an auditory signal in real-time or to produce interactive auditory feedback. Such feedback is either created from scratch using sound synthesis techniques or obtained by manipulating recorded samples. Examples of such systems are an interface which is controlled by the human voice or an interactive installation where the sounds change according to users' motions, or a tangible sonic interface embedded with sensors. The posed problem must be motivated, analysed and its solution evaluated using quantitative experiments and statistics. As specified by the Study Board for Media Technology, a sub-theme description is formulated in connection with the project. In connection with the project a minimum of five related seminars /lectures are offered. Students who complete the course module will obtain the following qualifications: Knowledge <ul style="list-style-type: none">• Knowledge about theories and techniques within audio design and computing• Describe basic concepts and terminologies in the field of sound design and processing• Understand how to evaluate the proposed solution using quantitative experiments and statistics• Knowledge about how to create interactive sound systems that react to users' action• Knowledge about applications of sensors technologies (electrical transducers) to interactive systems Skills <ul style="list-style-type: none">• Analyse a problem and suggest a solution that uses relevant theories and methods from interactive sound design and computing• Apply programming in a multimedia system where sound and interaction play an important role• Identify relevant constraints and assessment criteria for a system based on audition, in terms of usability and technical aspects (analysis)• Design an interactive system wherein audio is used as either input and/or output, using relevant theories from sound and music computing (application)• Apply electrical transducer(s) as input devices for an interactive system• Apply passive electronics to interface the transducer(s) with the computer• Assess the proposed solution using a quantitative experiment and statistics (analysis)• Describe, communicate and argue the designed solution using proper terminologies and

theories from the fields of sound and music computing and experiment design, both orally and in a written report (**synthesis**)

Competencies

- Select relevant theories and methods from the field of sensors technology, mathematics and programming and apply these to solve a problem in sonic interaction (**synthesis**)
- Plan, structure, execute and evaluate a project within the field of sonic interaction (**synthesis**)

Type of instruction:

Academically supervised student-governed problem oriented project work

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

Oral group examination with internal censor based on:

- a written project report
- a media-technological artefact
- an A/V production that illustrates and summarizes the project

The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Audio Processing (Lydbehandling)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to knowledge obtained in Human Senses and Perception, Programming of Complex Software Systems, and Mathematics for Multimedia Applications</p>
<p>Objectives: The objective of this course is to give the students an introduction to audio processing, including a basic understanding of audio and music signals, how these are generated and what their properties are. The course takes its starting point in the physics of sound and how audio signals are measured using computers by sampling and quantization. The course then covers how to manipulate audio signals using filters and audio effects, like chorus, flanger, phaser, reverb, and equalizer, and how to design and analyse such effects. Moreover, it covers how to synthesise sound and music signals using, for example, physical models. Finally, the course covers how to analyse audio signals using the Fourier transform and auto-correlation.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Apply knowledge from auditory perception in working with sound • Knowledge of the physics of sound • Knowledge of how to measure physical properties of sound • Understand sampling, aliasing, quantization and signal-to-noise ratio • Understand the time and frequency domains • Understand the properties of audio signals in the time and frequency domains • Understand filters and filtering in the time domain and frequency domain • Understand convolution, impulse responses and transfer functions • Understand correlation • Understand basic sound synthesis techniques • Understand basic filter-based sound effects • Understand aspects of audio processing in real-time and off-line <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Implement filters for processing digital audio (application) • Quantitatively analyse audio signals using correlation and the Fourier transform • Implement sound effects and sound synthesis techniques (application) • Express and analyse filters as rational functions (application) • Apply complex numbers, finite/infinite sums, and integrals to analyse signals and filters (application) <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Students who complete this module will be able to build audio processing systems for interactive multimedia applications (synthesis)
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.</p>

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor.

The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Design and Analysis of Experiments (Design og analyse af eksperimenter)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to knowledge obtained in Interaction Design, Mathematics for Multimedia Applications, and Human Senses and Perception</p>
<p>Objectives: A crucial aspect of designing mediology systems, tools or applications is the need to evaluate the work experimentally. The knowledge of how to properly design experiments to collect and evaluate data is essential to answer many of the problems within mediology. Examples are testing which of two tracking algorithms is the most efficient; how users perform with different kinds of feedback; possible relationship between age and performance, etc.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Must be able to understand the basic concepts of probability: sample space of all possible events; combinatorics; independent events; conditional probability; Bayes' formula; binomial distribution, etc. • Must display knowledge about basic statistic terminology and treatment of data: distributions (probability density function, cumulative distribution function, quantile function); measures of central tendency and variability; histogram; central limit theorem, significance, power, type I and II errors, etc. • Must be able to understand advantages and disadvantages with different types of designs and studies (between-group and within-group designs; correlational studies; blind/double blind, complete/incomplete and balanced/unbalanced designs) • Must be able to understand the difference between common experimental designs, e.g., single sample experiments, two sample experiments, and factorial/multifactorial experiments • Must understand the basic experimental design principles of independence, randomization, replication, and blocking and how these can be applied in experiments. • Must be able to relate frequency distributions to the concept of hypothesis testing (understanding) • Must be able to understand possible ethical concerns for a study <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Must be able to design an experiment to measure changes in a dependent variable, identifying and efficiently controlling relevant independent variables (application) • Must be able to properly inform and instruct persons participating in a study (application) • Must be able to understand and select among the most common methods for statistical analysis and assessment of experimental data (e.g., t-test, analysis of variance, chi-square tests, binomial test, correlation, and simple linear and logistic regression) • Must be able to understand the difference between parametric and non-parametric analysis methods • Must be able to understand different measurement scales and discuss experiments in terms of reliability, bias and sensitivity • Must be able to discuss own data in terms of assumptions for statistical testing (application) • Must be able to use an existing statistical package to analyse and present experimental results

- Must be able to discuss and represent empirical data in different ways (describing text, numbers, formulas, graphs and figures) and shift between these according to the needs of the situation and context (**application**)
- Must be able to read, understand and implement experimental and empirical work as described in relevant literature (**application**)

Competencies

- Students who complete this module will be able to systematically design quantitative, scientific experiments, taking into account relevant factors (**application**)
- Students who complete this module will be able to use a statistical software package to analyse experimental data (**application**)
- Students who complete this module will be able to document their experimental results, and to understand experimental results presented by others (**application**)

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in..

The exam format is individual assessment based on a written or oral exam with an internal censor. The assessment is performed with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Physical Interface Design (Fysisk interfacdesign)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to knowledge obtained in Introduction to Programming, Interaction Design, and Mathematics for Multimedia Applications</p>
<p>Objectives: Physical Interface Design is a course module where students learn about basic principles of electronics and how different sensors can be interfaced to a microcontroller to design novel forms of interactions between man and machines.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Should be able to recall basic circuit theory concepts and rules, including resistance, voltage, current, Ohm's law, and Kirchoff's laws (knowledge) • Should be able to describe basic analog (e.g., potentiometers, force sensitive resistors) and digital (e.g., push button, touch interface) sensing technologies (knowledge) • Should be able to express how a micro-controller can be used for measuring/actuating analog and digital inputs/outputs by the use of sensors and output devices (e.g., displays, LEDs, and vibrators) (understanding) • Should be able to recall that some functionalities can be implemented using both hardware and software (knowledge), and to discuss the pros and cons of either solution (understanding) • Should be able to identify practical needs in electric circuits such as DC filtering and circuit protection (understanding) • Should be able to describe basic amplification (e.g., OpAmp) and filtering (e.g., RC and RL) circuits (knowledge) • Should be able to explain basic concepts such as sampling and scaling in context of real-time use of signals (understanding) <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Should be able to apply the taught skills and methods on physical interface design to develop a prototype/artifact, and to demonstrate its use (application) • Should be able to formulate a linear system of equations for voltage, current and resistance relationships in an electric circuit, and to solve the system to find unknown currents, voltages, or resistances (application) • Should be able to use an electronic circuit simulator (application) • Should be able to sketch and interpret an electric circuit diagram (application) • Should be able to Programme a microcontroller to make it read inputs from sensor circuits and produce output(s) to a user (e.g., vibration, light, and text) (application) • Should be able to examine and verify basic electric circuit designs using, e.g., a multimeter, and to test if a build electric circuit has the desired functionalities (analysis) • Should be able to apply basic interface design principles for realizing a physical interface for human-computer interaction in the context of use (application) • Should be able to assess the artifact by applying taught evaluation method(s) (evaluation) <p style="text-align: center;">Competencies</p>

- Should be able to summarize the whole design process of the artifact (**synthesis**)
- Should be able to use correct technical and theoretical terms in dissemination (**application**)

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

3.5 5th semester

Title: Audio-Visual Experiments (Audio-visuelle eksperimenter)
Size: 15 ECTS
Prerequisites: The module adds to knowledge obtained in 4 th semester
Objectives: <p>Computer generated imagery (CGI) is an integral part of visual media products. It is so abundant and of so high quality that oftentimes it is no longer noticed. We find CGI and animation in movies that are either entirely computer generated or substantial elements are made as special effects and we find CGI in commercials, music videos or for example visualizations of molecular biology. Interactive 3D computer graphics and animation applications are also becoming increasingly abundant and find them-selves into ever more aspects of our lives. They range from 3D computer games and animations for entertainment over mobile augmented-reality applications for navigation to visualizations of abstract phenomena in web-based applications. In addition to its wide range of applications areas, interactive 3D computer graphics and animation is also mediated in many different ways, from high-end desktop computers to hand-held devices, from projection screens to head-mounted displays, from monitors to laser light displays.</p> <p>The students shall learn about screen media production, computer graphics, animation and rendering techniques, including the analysis of relationships between audio-visual communication and the communication offered by animation and computer graphics technologies. The students shall develop their technical and methodological skills by creating audio-visual experiments and experiences that are pre-rendered and/or interactive.</p> <p>In this project module students will be working with analysing, designing and implementing (parts of) applications and media-technological experiments in which pre-rendered and/or real-time, interactive 3D computer graphics and animation are essential parts.</p> <p>This can, for example, be a 3D game based on a game-engine consisting of an animated short story, a custom-designed application for data visualization, an interactive edutainment installation, a mobile navigation application or even developing a technology and/or a methodology for a special effect or production tools for aiding in the implementation/production of such products.</p> <p>It is essential that projects contain elements of pre-rendered and/or real-time, interactive 3D computer graphics and animation and address an audio aspect, if applicable (and it has to be considered that many of the desired impacts on an audience can be achieved through the use of audio instead of, or in combination with, visuals). Film theory and cinematography must be applied wherever it can be applicable for the project or wherever the project can benefit from such theoretical and practical considerations. Evaluations of the designed solution must be conducted to investigate experiences, design criteria or formulated hypotheses.</p> <p>As specified by the Study Board for Media Technology, a sub-theme description is formulated in connection with the project. In connection with the project a minimum of five related seminars /lectures are offered.</p> <p>Students who complete the course module will obtain the following qualifications:</p>

Knowledge

- **Understanding** of modeling, animation and rendering techniques for high quality computer graphics imagery
- **Understanding** of film form and dramaturgic models
- **Analysis** of fundamental concepts and theories within screen media production, animation, rendering and computer graphics

Skills

- Ability to **analyse**, design and implement/produce an audio-visual pre-rendered and/or interactive artifact with a narrative element and aimed at communicating a formulated message or experience to a human user or group of users
- Ability to **analyse** relationships between established theories for audio-visual communication and the communicative possibilities offered by animation and computer graphics rendering technologies
- Ability to **apply** theories, methods and techniques within animation, rendering and computer graphics (to create a pre-rendered and/or interactive application or a communicative artefact/installation)
- Ability to analyse theoretical and practical issues in pre-rendered and/or interactive 3D computer graphics and to synthesise solutions for such issues (**application**)
- Ability to **apply** 3D modeling, animation and rendering techniques to synthesise pre-rendered and/or interactive 3D computer graphics content.
- Ability to **apply** cinematographic concepts in state-of-the-art graphics rendering tools for pre-rendered and/or interactive content
- Ability to **analyse** the audio-visual communication possibilities and requirements associated with a chosen project subject
- Ability to **analyse** the technical requirements associated with the chosen project subject
- Ability to **synthesise** an effective solution to the chosen project domain by bringing together relevant concepts, theories and techniques from the fields of film theory and 3D computer animation, rendering and graphics

Competencies

- Ability to **synthesise** knowledge, methodology, theories and/or techniques concerning a problem centered around computer generated pre-rendered and/or interactive imagery or animation content that are effective according to some chosen communication requirements
- Ability to **analyse** the product requirements of a pre-rendered and/or interactive graphics application and to synthesise a functional/formal specification for it
- Ability to critically **evaluate** knowledge in comparison to the knowledge required for the project work - in particular knowledge in 3D computer graphics rendering, animation, human-computer interaction and/or audio visual design and Programmemeing
- Ability to **evaluate** the designed solution in order to investigate experiences, design criteria or formulated hypotheses.

Type of instruction:

Academically supervised student-governed problem oriented project work.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

Oral group examination with external censor based on:

- a written project report
- a media-technological artefact
- an A/V production that illustrates and summarizes the project

The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Computer Graphics Programming (Computergrafik programmering)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to knowledge obtained in Introduction to Programming, Mathematics for Multi-media Applications, Image Processing, and Programming of Complex Software Systems</p>
<p>Objectives: The course provides an introduction to real-time computer graphics concepts and techniques. The focus is on programmable functionalities (i.e., shader programs) of modern Graphics Programming Units (GPUs) as offered by graphics APIs such as OpenGL. It also covers the relevant underlying mathematical concepts (e.g., transformations between coordinate systems) and mathematical models (e.g., Phong's reflection model), as well as how these are applied in GPU-based shader programs.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Ability to describe the programmable, hardware-accelerated graphics rendering pipeline as exposed, for example, by OpenGL, and its relationship and interaction with the central processing unit (knowledge) • Ability to describe the concepts of vector bases, vector spaces, and coordinate systems as well as transformations between them (application) • Ability to describe the mathematical representation of any rotation of 3D space by a matrix, by an axis and an angle, and by a quaternion (application) • Ability to explain the computation of quadratic Bezier curves and splines (application) • Ability to describe the interpolation of vertex attributes such as colors (e.g., for pre-vertex lighting), normals (e.g., for per-pixel lighting), and texture coordinates (knowledge) • Ability to describe framebuffer operations including blending and depth tests (knowledge) • Ability to explain acceleration techniques such as viewport clipping and backface culling (understanding) • Ability to explain techniques to improve image quality such as antialiasing by super-sampling and mipmap texture filtering (understanding) • Ability to explain common performance bottlenecks of GPUs – including GPUs for mobile devices (understanding) <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Ability to describe the 4x4 matrix representation and application of any 3D affine transformation in homogeneous coordinates and apply it in a GPU-based shader program (application) • Ability to describe real-time local illumination models, in particular the Phong reflection model and apply them in a GPU-based shader program (application) • Ability to explain texture mapping techniques including compositing of multiple textures, normal mapping, environment/reflection mapping, and shadow mapping and apply them in a GPU-based shader program (application) <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Ability to create a program for procedurally generating and interactively controlling and rendering three-dimensional content (application)

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Rendering and Animation Techniques (Rendering og animation)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to knowledge obtained in Audio-Visual Sketching, Mathematics for Multimedia Applications, Human Senses and Perception, and Programming of Complex Software Systems</p>
<p>Objectives: Rendering is the last major step in the graphical pipeline, giving the final appearance to the models and animation. 3D computer animation combines 3D models of objects and motion based on key-frames, procedural-, or interactive input. This course empowers students to synthesise (design, create and render) image sequences and/or animations, 3D content or related assets, including animation for real-time applications, according to some desired visual expression by using state-of-the-art rendering platforms.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Knowledge of basic concepts of radiometry/photometry • Understanding of the ray tracing technique • Understanding of the differences between local and global illumination • Understanding of trade-offs between rendering quality and rendering time • Understanding camera matching, illumination matching, and High Dynamic Range environment maps for augmentation/compositing • Understanding modelling, rigging, and skinning for animation • Understanding kinematic constraints, forward and inverse kinematics needed for character- and procedural animation • Understanding of mathematical concepts to compute radiance/luminance levels in scenes with known illumination sources: solid angles and integration over spherical domains • Understanding concepts of procedural animation <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Ability to apply cinematographic elements to rendered sequences, i.e., working with camera effects (depth-of-field, motion blur, lens flares, etc.) and illumination, in order to achieve a desired visual expression • Ability to apply camera matching and image-based illumination for rendering virtual objects into image sequences • Ability to prepare 3D models for real-time and rendered animation by the application of rigging and skinning to them • Ability to apply various animation techniques to models, primarily those that are utilized in procedural animation, like forward/inverse kinematics, blending of animations, as well as morph target animation, per-vertex animation, shape interpolation, blend shapes • Ability to apply state-of-the-art modelling/animation/rendering tools in a production workflow involving export of models, key-framed animations and light maps to real-time rendering 3D platforms in order to utilize procedural and interactive user-controlled animation • Ability to apply mathematical knowledge from Mathematics for Multimedia Applications course to understand/program/debug relevant material in this course (spherical coordinates, numerical integration, and mathematics for ray tracing: vector/matrix calculation, line and plane equations, their intersections, quadratic equation of a circle/sphere, trigonometry in order to calculate distances and angles); and apply knowledge of basic calcu-

lus (position, velocity, acceleration of the body) for procedural animation

Competencies

- Ability to **synthesise** (design and create) rendered image sequences and/or real-time animations, 3D content or related assets according to some desired visual expression

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology.

To be eligible to take the exam the students must have fulfilled:

- Handing in of written assignments or the like
- Completion of certain – or all – study activities

The exam is an individual written or oral examination with internal censor. The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Screen Media (Screen Media)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to knowledge obtained in Audio-Visual Sketching and Human senses and Perception</p>
<p>Objectives:</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Must have knowledge of historical and theoretical aspects of motion picture and screen media production and technology • Must be able to understand general theories and practices within film/media productions • Must be able to understand film form • Must be able to understand dramaturgic models for scriptwriting • Must be able to understand continuity and discontinuity editing; spatial and temporal relations • Must be able to understand film production elements <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Must be able to apply theoretical aspects of motion picture in analysis of production • Must be able to understand mise-en-scene, cinematography and framing • Must be able to analyse traditional narrative theories and interactive narrative forms • Must be able to analyse film types and genres • Must be able to analyse major film theories and approaches • Must be able to apply theoretical knowledge to conduct film/media analysis <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Ability to synthesise new audio-visual artifacts based on theories and techniques • Ability to synthesise theoretical knowledge to construct audiovisual sequences and/or tools for designing audiovisual experiences or effects • Ability to synthesise soundscapes and audio-visual artifacts
<p>Type of instruction:</p> <p>Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.</p>
<p>Exam format:</p> <p>In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:</p> <p>To be eligible to take the exam the student must have fulfilled:</p> <ul style="list-style-type: none"> • handing in of written assignments or the like • completion of certain – or all – study activities <p>Note that if admittance to the exam or parts of the assessment is to be based on written work or</p>

exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor. The assessment is performed with the Pass/Fail grade.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

3.6 6th semester

Title: BSc Project Bachelorprojekt
Size: 15 ECTS
Prerequisites: The module adds to knowledge obtained in all previous semesters (project and course modules)
Objectives: Interactive Systems Design is a core element of Medialogy. The goal of the Medialogy 6th semester project module is for students to use the acquired knowledge, skills and competences from previous semesters and combined with what is learnt in this semester how to create their final bachelor project. Concerning design, analysis and evaluation, the final semester demands an advanced theoretical, methodological and reflective thinking. Students who complete the course module will obtain the following qualifications: Knowledge <ul style="list-style-type: none">• Understanding of emerging technologies when designing interactive media (synthesis)• Understanding of theories and methods for processing of sensory input, synthesising of outputs (sounds, graphics, touch) and design rules and concepts of software systems (application)• Understanding of societal contexts of a Medialogy application (analysis)• Understanding of the ‘vocabularies’ of specialized Medialogy disciplines to be able to communicate ideas and processes to experts (synthesis)• Knowledge of principles for designing, realizing, analysing and evaluating an interactive media product (evaluation)• Synthesis of methodological consideration to describe the theoretical and empirical foundation of the project• Understanding of theories of interactive systems design (application areas can be, e.g., a game, an art installation, an edutainment system, a rehabilitation system or a different service to the public) (application) Skills <ul style="list-style-type: none">• Ability to analyse previous research, theories and current trends concerning interactive and converging media• Ability to use such an analysis to synthesise an interactive media system involving auditory, visual and/or haptic feedback and alternative input devices (i.e., computer vision or tangible interfaces)• Ability to synthesise learned theories and methods in the design and implementation of an interactive media application• Ability to synthesise scientific methods in the investigation of previous research in the related field of interest• Ability to discuss the developed system with both end users and peers/professional experts (evaluation)• Ability to plan, design and perform and evaluate systematic test(s) of the media-technological artefact from a human-centered and/or system-based perspective wherever applicable in the specific context of the interactive system (analysis)

- Ability to implement and discuss feasibility, design requirement specifications and sustainability of the developed interface (**evaluation**). Furthermore feasibility should not be limited to economic considerations such as cost/benefit, but go beyond and include e.g., societal, political and technological impact-factors
- Must be able to discuss/assess the quality of the solution(s) of the project in a wider context (**evaluation**)

Competencies

- Generalize the gained experiences with managing the bachelor project and put them into perspective of the future course of study (**evaluation**)
- Ability to **synthesise** knowledge, methods, theories and techniques concerning a problem centered around an interactive system
- Must have competencies in combining a wide range of technologies, such as auditory and visual displays, input- and output devices, network and communication protocols in order to realize advanced and non-trivial applications and solutions (**synthesis**)
- Ability to collaborate with industry professionals, e.g., game designers, interaction designers, designers of interfaces for children and the disabled, GUI designers, in order to participate in the design and implementation of an interactive media product (**evaluation**)
- Ability to **synthesise** knowledge in various forms of documentation, e.g., written, oral presentations, A/V productions, portfolio and prototypes
- Ability to communicate and present the project applying scientific-based descriptions of aspects such as design, construction, analysis and evaluation of an interactive media including consideration of human factors (**evaluation**)
- Reflect on the possible ethical perspective of the interactive system, the science behind and discuss implications of a responsible professional practice (**analysis**)
- Must have competencies in comparing and assessing the potential of different technologies, methods and approaches in order to make the proper design choices for optimum functionality (**synthesis**)
- Must show command of the **knowledge**, skills and competencies acquired in the semesters 1-5 at least to the level of learning as described for the individual respective courses and project modules

Type of instruction:

Academically supervised student-governed problem oriented project work.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

Oral group examination with external censor based on:

- a written project report
- a media-technological artefact
- an A/V production that illustrates and summarizes the project

The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Artificial Intelligence Programmemeing (Programmering af kunstig intelligens)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to knowledge obtained in Computer Graphics Programming</p>
<p>Objectives: Concepts of artificial intelligence (AI) are central to the design and development of contemporary systems, e.g., database search and management, handheld devices (e.g., smartphones and tablets), games (e.g., chess), various adapting or learning systems, and so on. The objective of this course is to give students exposure to and an understanding of the fundamentals of AI programming, including: rational agents and their environment, knowledge representation, formal languages and logic, reasoning, basic graph theory, pathfinding algorithms, finite state automata, steering behaviors, and decision making. Students will develop practical skills in AI programming useful for the development and deployment of intelligent systems.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Understand different levels of intelligent agent architectures, environments, and their application domains • Understand basic graph theory • Understand finite state machines, decision trees, and behaviour trees, and their implementation • Understand different search strategies, and their implementation and underlying data-structures • Understand different pathfinding algorithms and their implementation • Understand steering algorithms and their implementation • Understand classical planning approaches • Understand knowledge representation, formal logic, and reasoning • Understand basic fuzzy logic <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Apply the above knowledge to construct an intelligent system using available technologies • Choose appropriate methods and technologies for a given problem (analysis) • Interpret and evaluate AI systems and their behaviour • Use agent simulation systems for prototyping system behaviour (apply) <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Ability to synthesise knowledge, methodology or techniques concerning a problem centred around intelligent systems • Ability to integrate AI-based libraries into larger projects (apply) • Ability to learn the use of AI tools like agent-based simulators, planning systems, network simulators, etc. (apply)
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and</p>

directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Ethnographically Informed Design (Etnografisk inspireret design)</p>
<p>Size: 5 ECTS</p>
<p>Objectives: In this course, we consider the larger picture and the situated nature of where and how people act and interact with media technologies. We work with theories, methods and material developed in successful design companies such as IDEO and Frog Design, which continue to evolve. The students will work with multiple evaluation methods that they apply in a hands-on approach that they consider as part of their ongoing critical reflection to the design process. The course will give students a better understanding of how chosen approaches, conceptual frameworks and methods produce different kinds of possible analyses for both the development, use and improvement of media technologies. The students will understand and apply selected user-centered, contextual and situational theories which can include ethnographic, psychological and sociological approaches and methods when analysing the use of media technology. The course will cover some of the large ranges of responses (e.g., interaction, reaction, deliberation, active and passive engagement) users can make when consuming media technologies, and provide students with methodological and analytic tools to analyse these responses in a given context and to implement these tools in their future design work.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Must have knowledge and understanding of empirical and critical research, including systematic quantitative and qualitative research data gathering, analysis and interpretation methods • Must understand and apply interpretative paradigms to media development. This includes evaluation of those approaches that promote qualitative methodologies, such as ethnography, grounded theory, case studies, discourse analysis, narrative research, diary studies, cultural probes and video interaction analysis, as well as application of quantitative methods including, for example, logging of use, physiological capture, or statistical analysis • Must understand that the theories and methodology adopted impact on the nature of evidence gathered in media related research (evaluation) • Must have knowledge of psychological, statistical, ethnographic, or sociological approaches to the study of contextual behaviour and their relevance and implications to media development and design (understand) • Must have knowledge and understanding how a variety of ethnographic methods including contextual data capture are useful for guidelines for testing and evaluation and iterative design (application) which can be implemented for user-oriented problems <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Must have ability to apply a range of qualitative methods (e.g., interviewing, contextual inquiry, etc.) to elicit user needs, preferences and capabilities and be able to analyse and explain the findings (understanding) • Must have ability to apply a range of quantitative methods, which may include logging and analysis, statistical tests, correlation and cluster analysis to assess perception and user behavior (understanding). • Apply observational methods to situations as they happen in real time and evaluate data in relation to end-user groups

- **Apply, analyse and evaluate** social, situated and digital micro and macro acts in interactions
- Design (**apply**) guidelines and **apply** adequate theories and study designs, using advanced qualitative and quantitative methods for collection and analysis of data (**analysis**)
- Design (**apply**) guidelines and **apply** different observational methods, including video observations and exploration of user states (e.g., immersed, engaged, emotional, pleasant).
- Design (**apply**) solutions to design and situated context related problems (**synthesis**)

Competencies

- Plan, organize and implement a full cycle of design, evaluation and re-design for a real world problem (**evaluation**)
- **Synthesise** and **apply** knowledge and understanding gained in the course regarding the consequence of choosing a specific approach, method, conceptual framework and theory in relation to media technology and a specific research question or problem
- **Understand** advantages, disadvantages, possibilities and limitations regarding the use of specific methods, for example, video card game, video Interaction analysis, discourse analysis, interviewing, questionnaires, storyboards, scenarios, and **know** statistical methods (e.g., tests, clustering, correlation analysis) or various psychological experimental paradigms (e.g., free categorization) (**analysis**)
- Synthesise, **understand** and **apply** in situ observational strategies, for example, shadowing, participation, video-observation for user evaluation and analysis in a context of media technologies (**application**)

Type of instruction:

Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Real-time Interfaces and Interactions (Realtids interfaces og interaktioner)</p>
<p>Size: 5 ECTS</p>
<p>Objectives: Real-time Interfaces and Interactions is a course module offering the students opportunities to investigate technologies addressing different modalities that are commonly associated with creation of integrated multimodal interactive systems. The course is built upon the previous five semesters to augment foundational knowledge, skills and competences needed to achieve integration of technologies and evaluation methods.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Understanding of the state-of-the-art in the field of alternative input and output technologies for uni- and multimodal applications (application) • Understanding of visualization techniques such as virtual or augmented reality (application) • Understanding of sound design methods and real-time audio processing techniques such as interactive auralization and sonification (application) • Understanding of the measurement and analysis of physiological data via sensors detecting signals present in the human body for techniques such as affective computing • Understanding of haptic interfaces, theory and implementation of haptic feedback systems using vibrotactile stimulation • Understanding adaptive systems which change behaviour according to user input within a session • Understanding of iterative design processes as used in the design of real-time interfaces and multimodal interactive systems <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Ability to synthesise new interface components of responsive Human-Computer Interaction systems, and log data from users and/or their interactions for data analysis • Ability to scientifically analyse and argue with theoretical and methodological justification to demonstrate understanding of related research/work in the current scientific discourse • Ability to apply real-time sensor inputs in the design of an interactive media product • Ability to synthesise and apply contextual understanding and knowledge related to human factors in the design of novel interfaces • Ability to apply theories, techniques and methods for the design and implementation of systems which can adapt to human needs and level of expertise <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Ability to synthesise knowledge and understanding regarding previous research and current trends concerning interactive media systems • Ability to apply such knowledge, understanding and skills toward creation of new interfaces and interactive systems that function in real-time (low latency response)
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and</p>

directions are decided and given by the Study Board for Media Technology.

Exam format:

In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination based on mandatory exercises and mini-project with internal censor. The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Theory and Practice of Game Design and Development (Teori og praksis af spildesign og -udvikling)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to knowledge obtained in 5th semester</p>
<p>Objectives: This course provides students with the foundational knowledge and practices in the design and development of games such as the social and economic context of gaming and game production, the game industry, formal and dramatic elements of games, system dynamics of games, iterative game design through playtesting, completeness and balance of games, and game technologies. It is a hands-on course in which the students are expected to create actual prototypes, evaluate and iteratively redesign them.</p> <p>Students who complete the course module will obtain the following qualifications:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> • Discuss the structure and formal elements of games – in particular players, objectives, procedures, rules, resources, conflict, boundaries and outcome – and dramatic elements of games – in particular challenge, play, premise, character, story, world building, and the dramatic arc (understanding) • Review the context of games, game classifications and players (understanding) • Explain game technologies including controllers, game engines (and their components such as render engines, audio engines, physics engines, etc.), and game development tools (understanding) • Describe the game development pipeline from idea via iterative design and development to product launch (understanding) • Describe the game industry and game entrepreneurship including platforms for distribution, independent developers, development studios, and publishers (understanding) <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> • Analyse and summarize (application) system dynamics of existing games • Create, present, critique and revise original game ideas (evaluation) • Iteratively produce (application) and evaluate key game features through playtesting of physical and/or digital prototypes • Judge completeness and balance (evaluation) and evaluate player experience of games and/or game prototypes with established metrics • Produce pitch materials including game demos and design documents (application) <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> • Plan, organize and implement a game (pre)production (application)
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.</p>
<p>Exam format: In accordance with the current Joint Programme Regulations and directions on examination from the</p>

Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

<p>Title: Technologies for Web and Social Media (Teknologier til internet og sociale medier)</p>
<p>Size: 5 ECTS</p>
<p>Prerequisites: The module adds to knowledge obtained in all previous programming courses</p>
<p>Objectives Web technologies are pervasive in the everyday life of most people in modern-day society and most public and private digital services are delivered through the world wide web. This course aims to introduce the students to the technologies and the practices adopted in web-based applications and web sites.</p> <p>The students will learn to develop new web-based systems, and maintain and extend existing systems. Furthermore, the students will learn to evaluate existing technologies and platforms, such as social media and web based services, and to develop integrated applications that make use of these platforms and contribute to them.</p> <p>Students who complete this course module will achieve the following competencies:</p> <p style="text-align: center;">Knowledge</p> <ul style="list-style-type: none"> ● Understand client-server architectures and basic networking ● Know the purpose, structure and basic functionalities of the hypertext transfer protocol ● Understand the purpose, characteristics and components of XML, HTML and CSS ● Know the basic principles of server-side development ● Analyse and explain the document object model ● Understand the principles of client-side development and DOM manipulation ● Apply techniques to debug and profile web systems ● Apply the principles of asynchronous client/server interaction ● Know the state-of-the art technologies in both server-side and client-side development. ● Understand the concept of mash-up and how to interact with external services (e.g., social media) <p style="text-align: center;">Skills</p> <ul style="list-style-type: none"> ● Synthesise and evaluate static and dynamic web pages and web based applications ● Analyse, correct and extend existing client- and server-side Programmes ● Apply external frameworks and API to integrate advanced functionalities and connections to existing services. ● Evaluate, employ and personalise existing web platforms - e.g., wiki, CMS or blogs <p style="text-align: center;">Competencies</p> <ul style="list-style-type: none"> ● Evaluate emerging web technologies ● Evaluate the limitations and the potentials of different web technologies and choose the most appropriate for a specific project
<p>Type of instruction: Refer to the overview of instruction types listed in the start of chapter 3. The types of instruction for this course are decided in accordance with the current Joint Programme Regulations and directions are decided and given by the Study Board for Media Technology.</p>
<p>Exam format: In accordance with the current Joint Programme Regulations and directions on examination</p>

from the
Study Board for Media Technology:

To be eligible to take the exam the student must have fulfilled:

- handing in of written assignments or the like
- completion of certain – or all – study activities

Note that if admittance to the exam or parts of the assessment is to be based on written work or exercises, a deadline is stipulated for when the work must be handed in.

Individual oral or written examination based on mandatory exercises and mini-project with internal censor. The assessment is performed in accordance with the 7-point grading scale.

Evaluation criteria:

The criteria for the evaluation are specified in the Joint Programme Regulations.

Chapter 4: Entry into Force, Interim Provisions and Revision

The curriculum is approved by the Dean of The Technical Faculty of IT Design and enters into force as of September 2017.

Students who wish to complete their studies under the previous curriculum from 2014 must conclude their education by the summer examination period 2020 at the latest, since examinations under the previous curriculum are not offered after this time.

Chapter 5: Other Provisions

5.1 Rules concerning written work, including the Bachelor's project

In the assessment of all written work, regardless of the language it is written in, weight is also given to the student's formulation and spelling ability, in addition to the academic content. Orthographic and grammatical correctness as well as stylistic proficiency are taken as a basis for the evaluation of language performance. Language performance must always be included as an independent dimension of the total evaluation. However, no examination can be assessed as 'Pass' on the basis of good language performance alone; similarly, an examination normally cannot be assessed as 'Fail' on the basis of poor language performance alone.

The Board of Studies can grant exemption from this in special cases (e.g., dyslexia or a native language other than Danish).

The Bachelor's project must include an English summary.¹ If the project is written in English, the summary must be in Danish.² The summary must be at least 1 page and not more than 2 pages (this is not included in any fixed minimum and maximum number of pages per student). The summary is included in the evaluation of the project as a whole.

5.2 Rules concerning credit transfer (*merit*), including the possibility for choice of modules that are part of another Programme at a university in Denmark or abroad

In the individual case, the Board of Studies can approve successfully completed (passed) Programme elements from other Master's Programmes in lieu of Programme elements in this Programme (credit transfer). The Board of Studies can also approve successfully completed (passed) Programme elements from another Danish Programme or a Programme outside of Denmark at the same level in lieu of Programme elements within this curriculum. Decisions on credit transfer are made by the Board of Studies based on an academic assessment. See the Joint Programme Regulations for the rules on credit transfer.

5.3 Rules concerning the progress and completion of the Bachelor's Programme

The student must participate in all first year examinations by the end of the first year of study in the Bachelor's Programme, in order to be able to continue the Programme. The first year of study must be passed by the end of the second year of study, in order that the student can continue his/her Bachelor's Programme.

In special cases, however, there may be exemption from the above if the student has been on a

¹ Or another foreign language (French, Spanish or German) upon approval by the Board of Studies.

² The Board of Studies can grant exemption from this.

leave of absence. Leave is granted during first year of study only in the event of maternity, adoption, military service, UN service or where there are exceptional circumstances.

5.4 Rules for examinations

The rules for examinations are stated in the Examination Policies and Procedures published by The Technical Faculty of IT and Design, The Faculty of Engineering and Science, and The Faculty of Medicine on their website.

5.5 Exemption

In exceptional circumstances, the study board can grant exemption from those parts of the curriculum that are not stipulated by law or ministerial order. Exemption regarding an examination applies to the immediate examination.

5.6 Rules and requirements for the reading of texts in foreign languages and a statement of the foreign language knowledge this assumes

At programs that are taught in Danish, it is assumed that the student can read academic texts in modern Danish, Norwegian, Swedish and English and use reference works, etc., in other European languages. At programs taught in English, it is assumed that the student can read academic text and use reference works, etc., in English

5.7 Additional information

The current version of the curriculum is published on the study board's website, including more detailed information about the Programme, including exams.