AALBORG UNIVERSITET

STUDIEORDNINGEN FOR KANDIDATUDDANNELSEN I LYD- OG MUSIKTEKNOLOGI, 2017, AALBORG

CIVILINGENIØR
AALBORG

MODULER SOM INDGÅR I STUDIEORDNINGEN

INDHOLDSFORTEGNELSE

FOUNDATIONS OF SMC

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Students are required to investigate sound and music computing from a formal perspective,work according to a scientific method, and report results in scientific forms of dissemination.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge, skills and competences as follows:

- Must be able to understand the core elements in sound processing, either considering sound as input modality (machine listening, such as segmentation and feature extraction, modeling and prediction, coding and classification, etc.), as output modality (sonic interaction design, new interfaces for musical expression).
- Must be able to understand principles of real-time sound processing, and music perception and cognition.

SKILLS

Students who complete the module will gain knowledge, skills and competences as follows:

- Must be able to **apply** theories of sound and music computing, to design, implement and evaluate a system which uses sound as input or output modality.

COMPETENCES

Students who complete the module will gain knowledge, skills and competences as follows:

- Must be able to synthesize relevant theory, techniques and tools to produce new knowledge and/or solutions.
- Must be able to synthesize and discuss research-based knowledge in the area of sound and music computing, in the format of a scientific paper

TYPE OF INSTRUCTION

Academically supervised student-governed problem oriented project work

EXAM

EXAMS

Name of exam	Foundations of SMC
Type of exam	Oral exam based on a project Exam format: In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral exam with an internal censor based on a scientific paper written in English and a media-technological product, an AVproduction illustrating and summarizing the project, and edited worksheets/portfolio documenting project details. The assessment is performed in accordance with the 7-point grading scale.

ECTS	15
Permitted aids	With certain aids: Please see Semester Description
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Grundlæggende lyd- og musikteknologi
Module code	MSNSMCM1171
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

SOUND PROCESSING

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

This class introduces the fundamental sound technology of digital signal processing from the viewpoint of sound synthesis and digital audio effects. Signal processing is concerned with the theory and practice behind acquisition, analysis, modification, and reconstruction of signals. It involves such theory as sampling and quantization, linear time-invariant systems, difference equations, the Fourier transform in its various forms, and the z-transform. The proper application and development of such systems requires competences in the acquisition and manipulation of sounds.

LEARNING OBJECTIVES

KNOWLEDGE

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

- Understand the application of transforms to analyze signals and systems
- Understand digital sampling, quantization, and reconstruction of audio signals, and the variety of technical specifications that accompany such systems, e.g., sampling rate, bit rate, quantization resolution, etc.
- Understand linear discrete-time systems
- Understand the z-transform for analyzing systems
- Understand transfer functions and frequency response
- Understand the Fourier transform in its various forms (including windowing)
- Understand the basic filter types, such as low-pass, high-pass, band-pass, etc., filters
- Understand filter implementations (IIR, FIR, forms) and their differences
- Understand delay lines and delay based effects (flangers, vibrato, chorus, echo)
- Understanding modulators and demodulators
- Understand different filter design methods
- Understand dynamic range control (e.g., compressor, expander, noise gate)
- Understanding spatial effects

SKILLS

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

- Design, implement and apply filters to sound and music signals and evaluate the results
- Apply the Fourier transform to analyzing signals and systems
- Apply the z-transform to analysis and design of filters
- Apply signal processing theory to the design of filters and digital audio effects.

COMPETENCES

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

- Apply appropriate methods and tools to analyze a sampled audio signal and evaluate with a high level of detail the content represented in the data
- Apply appropriate methods and tools to the design of a sound processing system comprising filters and/or audio effects
- Apply appropriate methods and tools to analyze a digital system and evaluate with a high level of detail how it affects sampled audio data passed through it.

TYPE OF INSTRUCTION

Lectures and laboratories.

EXAM

EXAMS

Name of exam	Sound Processing
Type of exam	Oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral examination comprising examination in a) theoretical parts (lectures) and b) practical part (laboratories), grading according to the 7-point scale with internal censor.
ECTS	5
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Lydprocessering
Module code	MSNSMCM1172
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

MACHINE LEARNING FOR MEDIA TECHNOLOGY

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objectives:

When designing and developing interactive media systems and technology, one is often faced with looking for interesting patterns and trends.This course presents theoretical concepts and practical tools for analyzing data for multimedia applications and solving machine learning problems, such as classification, in media techology. Many of these methods are used in, e.g., automatic speech recognition, face detection, web page ranking, autonomous driving, etc. The course includes the following topics: multivariate probability density functions, Bayesian classification, estimation, and detection, parametric (e.g., Gaussian density-based) and non-parametric classifiers (e.g. k-nn, parzen, convolutional neural networks), regression, data fitting, evaluation of classifiers and estimators, unsupervised and supervised learning (e.g., reinforcement learning), feature selection and reduction.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will obtain the following qualifications:

- **Understand** multivariate statistics and describe how to model multivariate data, e.g., using probabilistic and parametric descriptions
- **Understand** the principles of Bayesian classification
- **Understand** supervised (classification, regression) and unsupervised learning methods, (e.g., k-means clustering, principal component analysis)
- **Understand** features, feature selection, and dimensionality reduction

SKILLS

Students who complete the module will obtain the following qualifications:

- Choose, implement and **apply** pattern recognition tools to solve classification problems, e.g., footstep detection from accelerometers, recognition of single spoken digits
- **Apply** knowledge to compare classification methods in terms of performance and complexity
- **Apply** theory of multivariate statistics and **analyze** multimedia data, e.g., speech and music, images of faces, etc.

COMPETENCES

Students who complete the module will obtain the following qualifications:

- **Analyze** machine learning to a problem in media technology, and reflect on a variety of possibilities to recommend a solution
- **Apply** machine learning methods to this problem
- **Evaluate**, discuss and generalize the results and reflect on their implications regarding the problem and the data

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

EXAMS

Name of exam	Machine Learning for Media Technology
Type of exam	Written or oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.
ECTS	5
Permitted aids	With certain aids: See semester description
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Machine learning i medieteknologi
Module code	MSNMEDM1175
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Location of the lecture	Campus Aalborg, Campus Copenhagen, Campus Esbjerg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

MUSIC PERCEPTION AND COGNITION

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Musical information is created, communicated and processed in a wide variety of contexts and activities. Humans engage with music passively (e.g., when listening), actively (e.g., when composing) and interactively (e.g., when improvising or performing with others). Musical information may encode musical sound, perceived musical structure, the affective or semantic content of music, musical gestures or musical interactions. The ability to design and build effective and efficient computing systems for processing musical information requires an understanding of how such information is created, represented, communicated and processed by humans.

This course introduces experimental, theoretical, computational and neuroscientific work that has contributed to our understanding of how musical information is created, represented, communicated and processed, both in the brain and the body, when humans perform musical tasks such as listening, dancing, performing, composing and improvising.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete this course must gain the following knowledge:

- Must understand the basic cognitive and motoric mechanisms underlying expressive human performance (for example, in relation to timing and dynamics).
- Must have knowledge about musicians' interactions (with instruments, audience, and co-performers).
- Must understand current theories of how emotion (affect) is represented and communicated by music.
- Must understand current theories of the relationship between music and movement (embodied music cognition).
- Must understand current theories of how musical skills and knowledge are learnt and then applied in creative tasks such as composition and improvisation.

SKILLS

Students who complete this course must gain the following skills:

- Apply experimental methodologies in the design and execution of appropriate experiments for testing hypotheses in the field of music perception and cognition.
- Must be able to create and evaluate basic computational models of specific aspects of music perception and cognition (e.g., perception of musical streams, expressive timing).
- Must be able to evaluate theories and models of music perception and cognition.

COMPETENCES

Students who complete this course must gain the following competencies:

- Must be able to apply the basic principles underlying the perception and cognition of the main types of musical structure (including melodic, harmonic, motivic, tonal and rhythmic structure as well as the role of auditory streaming in music).
- Must be able to apply and synthesize understanding of experimental, computational, theoretical and neuroscientific research on music perception and cognition in the design and testing of music computing systems.
- Must be able to apply and synthesize understanding of experimental and theoretical work in music perception and cognition to the design, execution and analysis of appropriate experiments.
- Must be able to evaluate current experimental, theoretical and computational research in music perception and cognition.

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

EXAMS

Name of exam	Music Perception and Cognition
Type of exam	Written or oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral or written examination with internal censor. The assessment is performed in accordance with the 7-point scale.
ECTS	5
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Musikperception og -kognition
Module code	MSNSMCM1173
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

SOUND AND MUSIC INFORMATION RESEARCH

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 1st semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Explore the development and analysis of practical and automatic methods for making accessible information contained in abstract formats of sound and music signals, such as symbolic (sheet music), or digital audio samples, i.e., all the information that currently requires experienced humans to extract. These include various tasks in which one can analyze sound and music signals, e.g., determining the instruments playing, the pitch(es), the rhythm, beat, chord sequences, musical form, inferring or identifying the artist and song playing, organizing a music collection by genres (e.g., blues and/or hip hop), mood, (un)recommending music, creating playlists, composing new music, automatic mastering, recognizing auditory environments, and so on.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must be able to describe the structure of systems for audio or music classification, retrieval, and description.
- Must be able to distinguish between supervised and unsupervised learning, and how they are used in music information research.
- Must be able to identify and describe low-, mid- and high-level representations of sound and music, and how they are used in sound and music information research.
- Must be able to summarize the importance and relevance of human perception for sound music information research.

SKILLS

Students who complete the module will gain skills as follows:

- Must be able to analyze and compare a variety of approaches to audio and music content classification, retrieval, and description.
- Must be able to implement and evaluate methods for sound and music classification.
- Must be able to explain the concepts behind a complex integrated system for working with the contents of audio and/or music signals.
- Must be able to analyze the approaches and algorithms applied in a piece of scientific literature in music information research, interpret the assumptions made, and relate them to the goals of the work.

COMPETENCES

Students who complete the module will gain competences as follows:

- Must be able to design and implement a sound or music information retrieval system.
- Must be able to discuss, evaluate, and compare sound and music information retreival systems.

TYPE OF INSTRUCTION

Academically supervised student-governed problem oriented project work.

EXAM

EXAMS

Name of exam	Sound and Music Information Research
Type of exam	Oral exam based on a project In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral examination with external censor based on a written project report and a media-technological product plus an A/V production that illustrates and summarizes the project. The assessment is performed in accordance with the 7-point grading scale.
ECTS	15
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Informationsøgning i lyd og musik
Module code	MSNSMCM2173
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

REALTIME INTERACTION AND PERFORMANCE

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 1st semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

This module focuses on the study of real-time interaction from several perspectives, both conceptual technological, and performative.

The conceptual elements focus on real-time systems for musical interaction, including musical perspectives on the concepts of 'controllers' (interfaces and devices) and 'mapping', which are studied in depth. The musical context is a core focus in the class, including the study of expert interaction, analyzing concepts such as playability, explorability, non-linearity, control, expressiveness and virtuosic interaction.

The course focuses on technical concepts and aspects needed for state-of-the-art real-time interaction implementations. Different programming languages and paradigms for real-time communication protocols between applications are studied in the context of new interfaces for musical expression.

LEARNING OBJECTIVES

KNOWLEDGE

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

- Understanding the concepts of real-time interaction.
- Knowledge on the history and study of technology-based musical instruments.
- Understanding the concept of musical controller, mapping and feedback
- Understanding realtime human-computer interaction in a musical performance perspective.
- Understanding protocols for realtime communication in musical performance.

SKILLS

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

- Apply knowledge to the design of an interface for musical expression.

COMPETENCES

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

- Apply appropriate methods and theories for realtime interaction to the design of a novel interface for musical expression.

TYPE OF INSTRUCTION

Lectures and laboratories.

EXAM

EXAMS

Name of exam	Realtime Interaction and Performance

Type of exam	Oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral examination comprising examination in a) theoretical parts (lectures) and b) practical part (laboratories), grading according to the 7-point scale with internal censor.
ECTS	5
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Realtidsinteraktion og -udførelse
Module code	MSNSMCM2171
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

SOUND AND MUSIC SIGNAL ANALYSIS

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 1st semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The course introduces the fundamentals sound and music analysis: 1) methods required to perform analysis of sound and music signals; 2) representations commonly used in sound and music analysis; 3) various analysis tasks involving sound and music representations. The first part focuses on the basic methods, e.g., spectral analysis, parameter estimation, audio decomposition methods, filterbanks, etc. The second part includes commonly used representations for characterizing sound and music signals, e.g., parametric models, spectrograms, mel-frequency cepstral cofficients, chromagrams, and source-filter models. The third part focuses on examples of sound and music analysis tasks, e.g., tuning of musical instruments, transcription of music, key and chord detection, musical structure analysis, and modification of sound and music signals.

LEARNING OBJECTIVES

KNOWLEDGE

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

- Must be able to understand and describe spectral analysis, parameter estimation, methods for audio decompositions, and filterbanks.
- Must be able to distinguish between pitch, loudness and timbre, and explain how these relate to the various representations.
- Must be able to understand and identify how audio analysis tasks relate to human sound perception, and characteristics of music and sound.

SKILLS

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

- Must be able to analyze and explain the tools and representation used for a given sound and music analysis task.
- Must be able to select, implement and apply selected methods for analysis of sound and music signals.
- Must be able to evaluate the performance and properties of the selected methods and representations for sound and music analysis.
- Must be able to explain and argue for the assumptions made when using particular tools and representations for sound and music analysis.

COMPETENCES

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

- Must be able to understand and evaluate research in the area of sound and music signal analysis.
- Must be able to discuss and evaluate the appropriateness of various representations for a given sound and musical analysis task.
- Must be able to choose between and judge methods and representations for sound and music analysis.

TYPE OF INSTRUCTION

Lectures with exercises.

EXAM

EXAMS

Name of exam	Sound and Music Signal Analysis
Type of exam	Written or oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral or written examination with internal censor, grading according to the 7-point scale.
ECTS	5
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Analyse af musik- og lydsignaler
Module code	MSNSMCM2172
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

SONIC INTERACTION RESEARCH

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 1st semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Explore the field of sonic interaction design with a focus on one of the following applications: 1) Interactive product sound design, 2) sonic interactions in arts, 3) interactive sonification.

Perform an evaluation of the perceptual and/or cognitive aspects of sonic interactions from a human centered perspective.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must be able to understand the discipline of sonic interaction design.
- Must be able to understand action-perception relationships within sonic interaction and sonification.
- Must be able to understand principles of music perception, cognition and action.

SKILLS

Students who complete the module will gain skills as follows:

- Must be able to apply the acquired knowledge to the design of a system where interactive sound plays a salient role, being either in an artistic context, in the field of interactive product sound design, or in the field of interactive sonification.
- Must be able to apply knowledge in human sound perception and cognition to the evaluation of the proposed solution.

COMPETENCES

Students who complete the module will gain competences as follows:

- Must be able to evaluate the proposed application from a human centered perspective, and synthesize it to produce new knowledge and solutions.

TYPE OF INSTRUCTION

Academically supervised student-governed problem oriented project work.

EXAM

EXAMS

Name of exam	Sonic Interaction Research
Type of exam	Oral exam based on a project In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology:

	Oral examination with external censor based on a written project report and a media-technological product plus an A/V production that illustrates and summarizes the project. The assessment is performed in accordance with the 7-point grading scale.
ECTS	15
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Sonisk interaktion
Module code	MSNSMCM2174
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

SOUND AND MUSIC INNOVATION

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 2nd semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Develop and evaluate a novel system that uses concepts and technologies in sound and music computing with a focus on exploring 1) its commercial aspects, and/or 2) its socio-cultural implications, and/or 3) its use in generating scientific knowledge.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must be able to understand core state-of-the-art concepts, theories, techniques and methodologies relating to the sub-area of sound and music that has been applied in the project.
- Must be able to synthesize relevant concepts in media commercialization and innovation

SKILLS

Students who complete the module will gain skills as follows:

- Must be able to apply market and trend analysis methods to a media product or production involving sound and/or music processing
- Must be able to apply sound and music related tools and technologies to create products that are viable from a commercial, socio-cultural, and/or scientific perspective

COMPETENCES

Students who complete the module will gain competences as follows:

- Must be able to evaluate and select relevant sound and music theories, methods, and tools, with the specific aim of working towards creating new products, commercially viable products, or new knowledge.

TYPE OF INSTRUCTION

Academically supervised student-governed problem oriented project work.

EXAM

EXAMS

Name of exam	Sound and Music Innovation

Type of exam	Oral exam based on a project In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral examination with internal censor based on a written project report and a media-technological product plus an A/V-production that illustrates and summarizes the project. The assessment is performed in accordance with the 7-point grading scale.
ECTS	15
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Innovation i lyd og musik
Module code	MSNSMCM3171
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Location of the lecture	Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

RESEARCH IN SOUND AND MUSIC COMPUTING

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 2nd semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The goal of this course is to perform advanced work in one specific area of sound and music computing, building upon the foundations gained in the 1st and 2nd semesters. Students explore state of the art theories and techniques in a formalized manner by analyzing a selection of new research texts in a specific area of sound and music computing through, e.g., critical annotations, paper presentations, reproduction of experiments, etc.

Possible areas of research are music information retrieval, music perception and cognition, sonic interaction design, sound and music signal analysis and synthesis and new interfaces for musical expression.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must be able to understand theories and principles related to a specific area of sound and music computing.

SKILLS

Students who complete the module will gain skills as follows:

- Must be able to analyze research papers related to a specific area of sound and music computing.
- Must be able to apply concepts, tools, theories and technologies of sound and music computing to address a specific research problem.

COMPETENCES

Students who complete the module will gain competences as follows:

- Must be able to synthesize scientific knowledge in a specific topic in sound and music computing.

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

EXAMS

Name of exam	Research in Sound and Music Computing
Type of exam	Written or oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral or written examination with internal censor. The assessment is performed in accordance with the 7-point grading scale.

ECTS	5
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Studier i lyd og musik
Module code	MSNSMCM3172
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

PROJECT-ORIENTED WORK IN A COMPANY

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 2nd semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The Academic Internship must have a scope that corresponds the ECTS load.

Develop and evaluate a novel system that uses concepts and technologies in sound and music computing with a focus on exploring 1) its commercial aspects, and/or 2) its socio-cultural implications, and/or 3) its use in generating scientific knowledge.

The purpose of this project module is to give the student the opportunity to acquire practical, real-world experience with developing Sound and Music Computing products within the context of a company or an organization. The development must be subject to relevant constraints and conditions of the real-world context.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must be able to understand core state-of-the-art concepts, theories, techniques and methodologies relating to the sub-area of sound and music that has been applied in the project.
- Must be able to synthesize relevant concepts in media commercialization and innovation
- Must be able to understand professional, business-related and organizational concepts that are relevant for the hosting organization and the developed project.

SKILLS

Students who complete the module will gain skills as follows:

- Must be able to apply market and trend analysis methods to a media product or production involving sound and/or music processing
- Must be able to apply sound and music related tools and technologies to create products that are viable from a commercial, socio-cultural, and/or scientific perspective
- Must be able to apply host relevant constraints and affordances in the product design.

COMPETENCES

Students who complete the module will gain competences as follows:

- Must be able to evaluate and select relevant sound and music theories, methods, and tools, with the specific aim of working towards creating new products, commercially viable products, or new knowledge.

TYPE OF INSTRUCTION

Academically supervised student-governed problem oriented project work.

EXAM

EXAMS

Name of exam	Project-Oriented Work in a Company
Type of exam	Oral exam based on a project Oral examination on basis of a submitted Company Stay Report. Assessment: pass/fail.
ECTS	20
Permitted aids	With certain aids: Please see Semester Description.
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Projektorienteret forløb i en virksomhed
Module code	MSNSMCM3174
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	20
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

PROJECT-ORIENTED WORK IN A COMPANY

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 2nd semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The Academic Internship must have a scope that corresponds the ECTS load.

Develop and evaluate a novel system that uses concepts and technologies in sound and music computing with a focus on exploring 1) its commercial aspects, and/or 2) its socio-cultural implications, and/or 3) its use in generating scientific knowledge.

The purpose of this project module is to give the student the opportunity to acquire practical, real-world experience with developing Sound and Music Computing products within the context of a company or an organization. The development must be subject to relevant constraints and conditions of the real-world context.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must be able to understand core state-of-the-art concepts, theories, techniques and methodologies relating to the sub-area of sound and music that has been applied in the project.
- Must be able to synthesize relevant concepts in media commercialization and innovation
- Must be able to understand professional, business-related and organizational concepts that are relevant for the hosting organization and the developed project.

SKILLS

Students who complete the module will gain skills as follows:

- Must be able to apply market and trend analysis methods to a media product or production involving sound and/or music processing
- Must be able to apply sound and music related tools and technologies to create products that are viable from a commercial, socio-cultural, and/or scientific perspective
- Must be able to apply host relevant constraints and affordances in the product design.

COMPETENCES

Students who complete the module will gain competences as follows:

- Must be able to evaluate and select relevant sound and music theories, methods, and tools, with the specific aim of working towards creating new products, commercially viable products, or new knowledge.

TYPE OF INSTRUCTION

Academically supervised student-governed problem oriented project work.

EXAM

EXAMS

Name of exam	Project-Oriented Work in a Company
Type of exam	Oral exam based on a project Oral examination on basis of a submitted Company Stay Report. Assessment: pass/fail.
ECTS	25
Permitted aids	With certain aids: Please see Semester Description.
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Projektorienteret forløb i en virksomhed
Module code	MSNSMCM3175
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	25
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

PROJECT-ORIENTED WORK IN A COMPANY

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 2nd semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The Academic Internship must have a scope that corresponds the ECTS load.

Develop and evaluate a novel system that uses concepts and technologies in sound and music computing with a focus on exploring 1) its commercial aspects, and/or 2) its socio-cultural implications, and/or 3) its use in generating scientific knowledge.

The purpose of this project module is to give the student the opportunity to acquire practical, real-world experience with developing Sound and Music Computing products within the context of a company or an organization. The development must be subject to relevant constraints and conditions of the real-world context.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must be able to understand core state-of-the-art concepts, theories, techniques and methodologies relating to the sub-area of sound and music that has been applied in the project.
- Must be able to synthesize relevant concepts in media commercialization and innovation
- Must be able to understand professional, business-related and organizational concepts that are relevant for the hosting organization and the developed project.

SKILLS

Students who complete the module will gain skills as follows:

- Must be able to apply market and trend analysis methods to a media product or production involving sound and/or music processing
- Must be able to apply sound and music related tools and technologies to create products that are viable from a commercial, socio-cultural, and/or scientific perspective
- Must be able to apply host relevant constraints and affordances in the product design.

COMPETENCES

Students who complete the module will gain competences as follows:

- Must be able to evaluate and select relevant sound and music theories, methods, and tools, with the specific aim of working towards creating new products, commercially viable products, or new knowledge.

TYPE OF INSTRUCTION

Academically supervised student-governed problem oriented project work.

EXAM

EXAMS

Name of exam	Project-Oriented Work in a Company
Type of exam	Oral exam based on a project Oral examination on basis of a submitted Company Stay Report. Assessment: pass/fail.
ECTS	30
Permitted aids	With certain aids: Please see Semester Description.
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Projektorienteret forløb i en virksomhed
Module code	MSNSMCM3173
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	30
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

MASTER'S THESIS

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 1st, 2nd, and 3rd semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

To document that the student, independently or in a small group, is capable of planning and completing a major research project in sound and music computing. The final thesis must document the student's ability to apply scientific theories and methods, critically analyze existing work, and synthesize new knowledge.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must have knowledge and understanding in one or more subject areas that are representative of the state of the art in the research community of sound and music computing.
- Can understand and, on a scientific basis, apply an area of sound and music computing and identify scientific problems.

SKILLS

Students who complete the module will gain skills as follows:

- Synthesize scientific methods and tools and general skills related to sound and music computing.
- Can evaluate and select among scientific theories, methods, tools and general skills, and on a scientific basis, advance new analysis methods and solutions in sound and music computing.
- Can synthesize research-based knowledge and discuss professional and scientific problems with both peers and non-specialists.

COMPETENCES

Students who complete the module will gain competences as follows:

- Can synthesize work and development situations that are complex, unpredictable and require new solutions.
- Can apply acquired knowledge to independently initiate and implement discipline-specific and interdisciplinary cooperation, and assume professional responsibility.
- Can independently synthesize and take responsibility for their own professional development and specialisation.

TYPE OF INSTRUCTION

Academically supervised student-governed problem oriented project work.

The project is carried out individually or in small groups of a maximum of three students. At least one internal supervisor is assigned, who deals with the primary area of the project in his or her research.

EXAM

EXAMS

Name of exam	Master's Thesis

Type of exam	Oral exam based on a project In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral examination with external censor based on a written project report and a media-technological product plus an A/V-production illustrating and summarizing the project. The assessment is performed in accordance with the 7-point grading scale.
ECTS	50
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Kandidatspeciale
Module code	MSNSMCM4172
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	50
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

MASTER'S THESIS

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 1st, 2nd, and 3rd semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The master thesis caan be conducted as a long master thesis. If choosing to do a long master thesis, it has to include experimental work and has to be approved by the study board. The amount of experimental work must reflect the allotted ECTS.

To document that the student, independently or in a small group, is capable of planning and completing a major research project in sound and music computing. The final thesis must document the student's ability to apply scientific theories and methods, critically analyze existing work, and synthesize new knowledge.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must have knowledge and understanding in one or more subject areas that are representative of the state of the art in the research community of sound and music computing.
- Can understand and, on a scientific basis, apply an area of sound and music computing and identify scientific problems.

SKILLS

Students who complete the module will gain skills as follows:

- Synthesize scientific methods and tools and general skills related to sound and music computing.
- Can evaluate and select among scientific theories, methods, tools and general skills, and on a scientific basis, advance new analysis methods and solutions in sound and music computing.
- Can synthesize research-based knowledge and discuss professional and scientific problems with both peers and non-specialists.

COMPETENCES

Students who complete the module will gain competences as follows:

- Can synthesize work and development situations that are complex, unpredictable and require new solutions.
- Can apply acquired knowledge to independently initiate and implement discipline-specific and interdisciplinary cooperation, and assume professional responsibility.
- Can independently synthesize and take responsibility for their own professional development and specialisation.

TYPE OF INSTRUCTION

Academically supervised student-governed problem oriented project work.

The project is carried out individually or in small groups of a maximum of three students. At least one internal supervisor is assigned, who deals with the primary area of the project in his or her research.

EXAM

EXAMS

Name of exam	Master's Thesis
Type of exam	Oral exam based on a project In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral examination with external censor based on a written project report and a media-technological product plus an A/V-production illustrating and summarizing the project. The assessment is performed in accordance with the 7-point grading scale.
ECTS	30
Permitted aids	With certain aids: Please see Semester Description.
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Kandidatspeciale
Module code	MSNSMCM4171
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	30
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

ALGORITHMS, DATA STRUCTURES AND SOFTWARE ENGINEERING FOR MEDIA TECHNOLOGY

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the 1st semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objectives:

The goal of this module is to strengthen a student's ability to use efficient and appropriate algorithms, data structures and software engineering techniques in the design, implementation and analysis of media technology software.

The topics covered in the course may include: efficient data structures (e.g., trees and heaps), advanced algorithmic techniques (e.g., divide-and-conquer, dynamic programming, greedy algorithms), methods for analysing software (e.g., analysis of time and space complexity), machine-learning algorithms (e.g., k-NN, SVM, neural networks), and advanced software engineering concepts (e.g., generics, closures, reflection, GPU programming).

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will obtain the following qualifications:

- Must understand the fundamentals of algorithm design and analysis.
- Must understand methods for analysing time and space complexity.
- Must understand basic and advanced data structures used in various computational problems.
- Must understand advanced algorithmic techniques such as recursion and dynamic programming.
- Must have knowledge of basic machine learning algorithms and techniques.
- Must understand advanced software engineering concepts and programming techniques.

SKILLS

Students who complete the module will obtain the following qualifications:

- Must be able to select and implement efficient and appropriate algorithms, data structures and software engineering techniques to solve programming problems in media technology.
- Must be able to work in a group to build a substantial media-technological product that uses state-of-the-art programming techniques.

COMPETENCES

Students who complete the module will obtain the following qualifications:

- Ability to analyse multimedia software engineering problems and select and implement efficient and appropriate algorithms, data structures and software engineering techniques to develop successful solutions.
- Ability to analyse solutions and quantify their resource requirements in terms of time and space complexity.

TYPE OF INSTRUCTION

Refer to the overview of instruction types listed in § 17. 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

EXAMS

Name of exam	Algorithms, Data Structures and Software Engineering for Media Technology
Type of exam	Written or oral exam
ECTS	5
Permitted aids	With certain aids: See semester description
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Algoritmer, datastrukturer og software engineering for medieteknologi
Module code	MSNMEDM2172
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Location of the lecture	Campus Aalborg, Campus Copenhagen, Campus Esbjerg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

EMBODIED INTERACTION

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objectives:

The course presents the emerging theory of embodied interaction interleaved with practical implementations of intelligent systems, where the participants work on open-source, community-supported interactive audio-visual coding platforms, such as Processing and open Frameworks.

The focus of the theoretical part is on embodied mind and cognition, intelligent agents, and movement as design material. These will be centered on emerging literature (e.g., Proc. Intl. Workshop on Movement and Computing: http://moco.ircam.fr).

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will obtain the following qualifications:

- Must have **knowledge** about standard methods and techniques in embodied interaction
- Must be able to **understand** and describe movement as a design material.
- Must be able to **understand** the bodily skills needed for technological development, decision making, steering and path finding
- Must be able to **understand** what movement qualities are and how they are extracted from movement tracking data.

SKILLS

Students who complete the module will obtain the following qualifications:

- Must be able to **apply** methods and techniques to real world scenarios (e.g., games, robots, public installations, etc.).

COMPETENCES

Students who complete the module will obtain the following qualifications:

- Must be able to **analyze** a problem, design a solution and translate it into an intelligent embodied system.
- Must be able to **analyze**, compare, and assess the potential of different methods and techniques in order to make the proper design choices.
- Must be able to **synthesize** results and concepts in a professional way equivalent to practices in Embodied Interaction.

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

EXAMS

Name of exam	Embodied Interaction

Type of exam	Written or oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Individual oral or written examination with internal censor. The assessment is performed with the 7-point scale.
ECTS	5
Permitted aids	With certain aids: See semester description
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Embodied interaction
Module code	MSNMEDM2174
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Location of the lecture	Campus Aalborg, Campus Copenhagen, Campus Esbjerg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

HUMAN SOUND PERCEPTION AND AUDIO ENGINEERING

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about the anatomy and physiology of the human ear.
- Must have knowledge about hearing diagnosis and disorders.
- Must have knowledge about fundamental properties of human sound perception (e.g. Loudness, pitch, masking, spatial hearing and time / frequency resolution).
- Must have basic knowledge about modern audio engineering including recording, reproduction and signal processing techniques (perceptive coding principles and formats, audio effects).
- Must have knowledge about multi-channel recording, storage and reproduction of sound.
- Must have knowledge about public address techniques.
- Must have insight in digital audio interfaces and standards.
- Must have insight in low noise audio design and interconnections.

SKILLS

- Must be able to set up audio systems for recording or reproduction in an appropriate way to optimize the system and minimize noise.
- Must be able to set up audio systems according to relevant standards.

COMPETENCES

- Based on the acquired knowledge, the student should be able to critically evaluate systems and specifications within audio and acoustics with a basis in human sound perception.

TYPE OF INSTRUCTION

As described in § 17.

EXAM

EXAMS

Name of exam	Human Sound Perception and Audio Engineering
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Menneskets lydopfattelse og audio teknik

Module code	ESNSPAK2K2
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

PHYSICAL MODELS FOR SOUND SYNTHESIS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The module gives an in-depth introduction to modelling of physical systems and the analogies between dynamics systems such as mechanical, electronic, and acoustic systems. Constructing and modelling physical systems requires an understanding of basic kinematics and kinetics. In turn, models of dynamic systems have analogies that can be described by the same underlying mathematics. Students who complete this module will understand how to simulate physics based sound and music systems such as musical instruments and everyday objects.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will gain knowledge as follows:

- Must have **knowledge** about the numerical methods for sound synthesis
- Must have **knowledge** about mass-spring systems, digital waveguides and other sound related synthesis methods.
- Must be able to **understand** the analogy between various dynamic systems, i.e. electronic, mechanical and acoustics systems
- Must be able to **understand** how to simulate the sound produce by a musical instrument or everyday object.

SKILLS

Students who complete the module will gain skills as follows:

- Must be able to **apply** knowledge to the creation of a physics based sound system.
- Must be able to **understand** how to calculate and model forces of dynamic systems
- Must be able to select and **apply** methods for modelling the analogy between various dynamic systems i.e. electronic, mechanical and acoustics.

COMPETENCES

Students who complete the module will gain competences as follows

- Must be able to **understand** how to collaborate within teams designing, building and modelling physical artefacts
- Must be able to **synthesize** methods for modelling of physical systems and analogies between various dynamic systems such as electronic and acoustics systems

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

EXAMS

Name of exam	Physical Models for Sound Synthesis

Type of exam	Written or oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Individual oral or written examination with internal censor. The assessment is performed with the 7-point scale.
ECTS	5
Permitted aids	With certain aids: Please see the semester description
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Fysiske Modeller for Lyd Syntese
Module code	MSNSMCM2175
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen, Campus Aalborg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

MULTIMODAL PERCEPTION AND COGNITION

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objectives:

In interactive-immersive systems that rely on digital technology, human interactivity and responsiveness are directly linked to the processes of human perception and cognition.

This course introduces current research trends and emerging paradigms on the relation between digital technologies and multi-modal perception and cognition. Particular emphasis is put on multi-modal perception processes that are usually involved in interactive digital media (e.g., visual, auditory, haptic, proprioception) and higher cognitive processes related to interactivity (e.g. multimodal integration, enaction, intelligibility, cognitive closure, affective states and emotions, spatial cognition and navigation).

The course draws relevant knowledge from a variety of disciplines and fields such as cognitive neuroscience, ecological psychology, biology, cognitive ergonomics and cognitive technologies. Different bio-behavioral and biofeedback methods for interaction design and assessment are also introduced (e.g. EEG, EMG, ECG, galvanic skin response, ocular measures) and new trends in integration of interactive digital technologies with cognitive processes are addressed (e.g. multi-modal interfaces and set-ups, brain-computer-interfaces, enactive interfaces). Finally, the course provides the opportunity for targeting the knowledge provided towards the specialisation profile chosen by the student (Computer graphics, Interaction, Games).

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will obtain the following qualifications:

- **Understanding** of the main paradigms, concepts and disciplines that contribute to multimodal perception research and cognition studies and which have relevance for the interaction of human subjects with immersive-interactive systems
- **Knowledge** about the potentialities and limits that the human “perceptual apparatus” and the cognitive system present for the technology designer
- **Understanding** of the relations between multimodal perception, higher cognitive functions, affective states and action

SKILLS

Students who complete the module will obtain the following qualifications:

- Ability to **apply** knowledge on human multimodal perception and cognition in the design of interactive digital systems
- Ability to **apply** knowledge to the design perception and cognition tests related to the cross-modal action of two or more senses
- Be able to **apply** biofeedback and bio-behavioral measurements in experimental designs

COMPETENCES

Students who complete the module will obtain the following qualifications:

- Ability to **synthesize** knowledge and theoretical frameworks from a variety of relevant sources and disciplines, which contribute to the study of technology-cognition interaction
- Be able to **synthesize** such knowledge in the design of multimodal interactive systems
- Ability to **analyse** and interpret experimental work and literature in the field

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

EXAMS

Name of exam	Multimodal Perception and Cognition
Type of exam	Written or oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral or written examination with internal censor. The assessment is performed in accordance with the 7-point grading scale.
ECTS	5
Permitted aids	With certain aids: See semester description
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Multimodal perception og kognition
Module code	MSNMEDM1176
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Location of the lecture	Campus Aalborg, Campus Copenhagen, Campus Esbjerg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

PROTOTYPING AND FABRICATION TECHNIQUES

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objectives:

In order to be part of a leading design team, it is essential to be able to develop and communicate new interaction design concepts for the implementation and production of future electronic devices. The course rationale is that students need to have an understanding of physical interaction design processes, where ideas are formed, developed and tested in proof-of-concept models that can be demonstrated to others via video, poster presentations, and working prototypes. The focus is on understanding and applying design and development strategies needed to move from concept to working prototype, with the most recent tools and techniques for producing new forms, input/output from computers and embedded systems, and interactive systems and devices. The course incorporates advanced fabrication techniques; students should be able to build a prototype for any concept they can imagine. By incorporating computer-assisted industrial and electronic design techniques, knowledge about specific design tools and procedures is gained. In order to be able to apply this knowledge, a thorough understanding of the many underlying concepts is required.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module will obtain the following qualifications:

- The student must have **knowledge** about various approaches to Concept Design methodologies
- The student must have **knowledge** about standard methods and techniques for prototyping of new devices and systems
- The student must be able to **understand** the relationship between concept development and implementation/fabrication, specifically regarding research-based prototyping techniques

SKILLS

Students who complete the module will obtain the following qualifications:

- The student must be able to **apply** concept design methods and prototyping techniques to real world scenarios involving fabrication of objects or systems with intended functionalities (e.g. responsive environments, interactive games, robots, musical interfaces, public installations, etc.) Specific skills to be gained by the student may include many of the following:
- **Knowledge** of concept development techniques
- **Knowledge** of modelling and design tools
- **Knowledge** of rapid prototyping techniques
- **Understanding** advanced microcontroller programming
- **Understanding** sensors, actuators, and displays
- **Understanding** wired and wireless communication protocols
- **Understanding** 3D input devices and haptics
- **Understanding** iterative development (redesign/polish of product)
- **Understanding** circuit design (schematic to printed circuit board)
- **Understanding** Field Programmable Gate Arrays

COMPETENCES

Students who complete the module will obtain the following qualifications:

- The student must be able to **analyse** a problem, design a solution and translate it into an rapid prototyping design
- The student must be able to **analyse** his/her solutions in order to compare and assess the potential of different concept design methods and prototyping techniques, iteratively making the proper design choices
- The student must be able to **synthesize** results and concepts in a professional way equivalent to practices in both academic and industrial contexts

TYPE OF INSTRUCTION

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

EXAMS

Name of exam	Prototyping and Fabrication Techniques
Type of exam	Written or oral exam In accordance with the current Joint Programme Regulations and directions on examination from the Study Board for Media Technology: Oral or written examination with internal censor. The assessment is performed with the Pass/Fail grade.
ECTS	5
Permitted aids	With certain aids: See semester description
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Prototyping og fremstillingsteknikker
Module code	MSNMEDM1179
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Location of the lecture	Campus Aalborg, Campus Copenhagen, Campus Esbjerg
Responsible for the module	Claus Brøndgaard Madsen

ORGANISATION

Study Board	Study Board of Media Technology
Department	Department of Architecture, Design and Media Technology
Faculty	Technical Faculty of IT and Design

APPLIED EXPERIMENTAL PSYCHOLOGY AND PSYCHO-PHYSICS

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module builds on knowledge of basic statistics and probability theory

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Must have knowledge of the psychophysical methods that can be used to measure human perception, cognition, and performance, including:

- Threshold and comparison methods
- Quantitative methods for measuring psychophysical responses including, nominal, ordinal, interval and ratio scales.
- Transformation of data to relevant scales. Normalization and standardization.
- Comparative and non-comparative scaling: paired comparison and semantic differential techniques.
- Probabilistic choice models for paired comparison (BTL), and the concept of transitivity.
- Descriptive analysis, including selection and use of censor panels for scaling experiments, word elicitation, selection, scaling and analysis.
- Practical design of scales.
- Design of scaling experiments.
- Factor analysis

SKILLS

- Carry out measurement and scaling of psychophysical responses.
- Use statistical software for analysis of the results.

COMPETENCES

- Can choose the appropriate psychophysical method for a given problem.
- Have experience carrying out experiments using appropriate methods.
- Can analyse the results from experiments using appropriate statistical methods.

TYPE OF INSTRUCTION

Lectures followed by exercises and/or lab-work.

EXAM

EXAMS

Name of exam	Applied Experimental Psychology and Psycho-physics
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed

Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Anvendt eksperimentalpsykologi og psykofysik
Module code	ESNPDPK1K2AM
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design