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

AALBORG UNIVERSITY
DENMARK

Curriculum for the Master's Programme in Sound and Music Computing

Aalborg University

September 2017

Preface

Pursuant to Act 261 of March 18, 2015 on Universities (the University Act) with subsequent changes, the following curriculum for the Master's programme in Sound and Music Computing is stipulated. 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 Master's program in Sound and Music Computing 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 Programs) and Ministerial Order no. 1062 of June 30, 2016 on University Examinations (the Examination Order). Further reference is made to Ministerial Order no. 258 of March 18, 2015 (the Admission Order) and Ministerial Order no. 114 of February 3, 2015 (the Grading Scale Order) with subsequent changes.

1.2 Faculty affiliation

The Master's programme falls under the Technical Faculty of IT and Design, Aalborg University.

1.3 Board of Studies affiliation

The Master's programme falls under the Board of Studies for Media Technology.

1.4 External examiners corps

The Master's programme is associated with the external examiners corps "Ingeniøruddannelsernes landsdækkende censorkorps for elektro".

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

2.1 Admission

Applicants without legal claim to admission

- Bachelor of Science in Computer Science, Aalborg University
- Bachelor of Science in Electronic Engineering and IT, Aalborg University
- Bachelor of Science in Software, Aalborg University
- Bachelor of Science in Engineering Psychology, Aalborg University
- Bachelor of Science in Internet Technologies and Computer Engineering, Aalborg University
- Bachelor of Science in Electrical Engineering, Technical University of Denmark
- Bachelor of Science in Network Technology and IT, Technical University of Denmark
- Bachelor of Science in Mathematics and Technology, Technical University of Denmark
- Bachelor of Science in Software Technology, Technical University of Denmark
- Bachelor of Science in Engineering (Mechatronics), University of Southern Denmark
- Bachelor of Engineering in Information Technology, Aahus University
- Bachelor of Engineering in Electronic Engineering, Aarhus University
- Bachelor of Science in Medialogy, Aalborg University

Students with another Bachelor's degree, upon application to the Board of Studies, will be admitted after a specific academic assessment, if the applicant is deemed to have comparable educational prerequisites. The University can stipulate requirements concerning conducting additional exams prior to the start of study.

2.2 Degree designation in Danish and English

The Master's programme entitles the graduate to the designation Civilingeniør, Cand. Polyt i lyd- og musikteknologi. The English designation is Master of Science (MSC) in Engineering (sound and Music Computing.

2.3 The programme's specification in ECTS credits

The Master's programme is a 2-year, research-based, full-time study programme. The programme is set to 120 ECTS credits.

2.4 Competence profile on the diploma

The following competence profile will appear on the diploma:

A graduate of the Master's programme has competencies acquired through an educational programme that has taken place in a research environment.

The graduate of the Master's programme can perform highly qualified functions on the labour market on the basis of the educational programme. Moreover, the graduate has prerequisites for research (a Ph.D. programme). Compared to the Bachelor's degree, the graduate of the Master's programme has developed her/his academic knowledge and independence, so that the graduate can independently apply scientific theory and method in both an academic and occupational/professional context.

2.5 Competence profile of the programme

The mission of the Master's Programme in Sound and Music Computing is to train the professionals that will push forward the sound and music technologies of the new information society. By combining practical and theoretical approaches in topics such as computational modeling, audio engineering, perception, cognition, and interactive systems, the programme gives the scientific and technological background needed to start a research or professional career. This programme trains the students on the technologies for the analysis, description, synthesis, transformation and production of sound and music, and on the technologies and processes that support sound and music creation.

<u>The graduate of the Master's programme:</u>

Knowledge

- has in-depth **knowledge** and understanding of issues within the areas of sound and music technology and design.
- can **understand** and, on a scientific basis, reflect on the technical, organizational and market drivers in sound and music technology as well as the interplay between technology, market and user issues
- can **analyze** sound and music computing's knowledge, theory, methodologies and practice, and identify scientific issues

Skills

- ability to **synthesize** scientific methods, tools and general skills within the field of sound and music computing.
- ability to **evaluate** and select among relevant scientific theories, methods, tools and general skills and, on a scientific basis, advance new analyzes and solutions within the subject areas
- ability to **synthesize** research-based knowledge and discuss professional and scientific problems with both peers and non-specialists
- ability to **synthesize** knowledge in scientific writing: articles, reports, documentation, etc.
- ability to **analyze** and select among relevant theories, technologies and methods for development of sound and music technology solutions and services
- can **analyze** different technologies for optimal selection
- can **analyze** the research potential or the market, ethical and regulatory framework for application of the technologies

Competencies

- ability to **apply** acquired knowledge in research, innovation and entrepreneurship that can be used to explore and exploit the great potential of new media technologies with an engineering approach
- ability to **synthesize** acquired knowledge creatively and innovatively to identify and propose new opportunities and develop services/solutions, which can empower the users and assist them in solving their current and future tasks on a daily basis
- ability to **synthesize** project work and problem based learning in a global/multicultural environment
- ability to **apply** knowledge to independently initiate and implement discipline-specific and interdisciplinary cooperation and assume professional responsibility
- ability to **synthesize** knowledge and independently take responsibility for own professional development and specialization
- **apply** acquired knowledge in mediating collaborations and exchange between development- and business-related functions in organizations

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. Examinations are defined in the curriculum. Each semester has an overall theme, which is reflected in the scope of the (mandatory) course modules and semester projects.

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)
- teacher feedback
- reflection
- portfolio work

3.1 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 by assessment by the supervisor or course-responsible only.

An overview of the ECTS credit breakdown for the various semesters by modules is shown in the table form below.

In general, students may choose different options for the 1st, 2nd, 3rd and 4th semester. The thesis project must have a size of at least 30 ECTS, but it is possible to make larger thesis projects of 50 ECTS plus two 5 ECTS courses on the 3rd semester. The following options may be chosen:

Option 1:

- 3rd semester: 15 ECTS semester project, supplemented by courses
- 4th semester: 30 ECTS thesis project

Option 2:

- 3rd semester: Project-oriented work in a company in Denmark or abroad, or exchange in Denmark or abroad (in this case the mandatory courses on the 3rd semester may be waived)
- 4th semester: 30 ECTS thesis project

Option 3 (long thesis project):

- A thesis project of 50 ECTS and two courses from the third semester.

3.2 Courses

Semester	Module	ECTS	Assessment	Exam
1st	Foundations of SMC	15	7-point Scale	Internal
	Sound Processing	5	7-point Scale	Internal
	Machine Learning for Media Technology	5	7-point Scale	Internal
	Music Perception and Cognition	5	7-point Scale	Internal
2nd	Realtime Interaction and Performance	5	7-point Scale	Internal
	Sound and Music Signal Analysis	5	7-point Scale	Internal
	Choose 1 from the following:			
	Sound and Music Information Research	15	7-point Scale	External
	Sonic Interaction Research	15	7-point Scale	External
	Choose 1 from the following:			
	Algorithms, Data Structures and Software Engineering for Media Technology	5	7-point Scale	Internal
	Modelling physical systems	5	7-point Scale	Internal
	Human Sound Perception and Audio Engineering	5	Pass/Fail	Internal
	Embodied Interaction	5	7-point Scale	Internal
3rd	Sound and Music Innovation	15	7-point Scale	Internal
	Research in Sound and Music Computing	5	7-point Scale	Internal
	Choose 2 from the following:	5	7-point Scale	Internal
	Multimodal Perception and Cognition	5	7-point Scale	Internal
	Prototyping and Fabrication Techniques	5	Pass/Fail	Internal
	Applied Experimental Psychology and Psychophysics	5	Pass/Fail	Internal
or	Project-Oriented work in a Company	30 Posibbly 20[1] 25[2]	Pass/Fail	Internal
4th	Master's Thesis	30 Possibly 50[3]	7-point Scale	External
	Total	120		

Problem Based Learning:

[1] Plus mandatory 'Research in SMC' (5 ECTS) and a 5 ECTS elective course
[2] Plus mandatory 'Research in SMC' (5 ECTS)
[3] Plus mandatory 'Research in SMC' (5 ECTS) and a 5 ECTS elective course

A compulsory course in Problem Based Learning (PBL) is offered as an integrated part of the project module to students not acquainted with PBL at Aalborg University.

Semester project
Foundations of SMC
(Grundlæggende lyd- og musikteknologi)
Semester: 1st semester

Objectives:
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..

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

Knowledge:

- 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:

- 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.

Competencies:

- 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 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.

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

Title:
Problem Based Learning (PBL) at Aalborg University
(Problembaseret læring på Aalborg Universitet)
(1st semester)

Prerequisites: None, but the course is compulsory for students not acquainted with the PBL model at Aalborg University

Objectives:
After completion of the course the student should

Knowledge:

- know how to describe in own words some of the fundamental principles of Problem Based Learning (PBL) as implemented in the Aalborg PBL model at the Faculty of Engineering and Science
- know how to identify similarities and differences between the Aalborg PBL study environment and previous study environments, incl. strengths and weaknesses in both environments

Skills:

- be able to structure project management activities based on a well-formulated problem formulation
- be able to assess project documentation based on scientific codes of conduct competences
- to plan for effective collaborative learning in an intercultural environment and manage group conflicts
- be able to reflect on, plan and manage a study project in a PBL learning environment

Type of Instructions: Lectures, discussions and group work. The course will take place during three Wednesday afternoons.

Assessment: Internal assessment during the course/class participation according to the rules in the Examination Policies and Procedures, addendum to the Joint Programme Regulations of the Technical Faculty of IT and Design, Aalborg University. In this case the assessment is primarily based on the oral performance during the course. This means that the student has to be active during the course time and participate in discussions. The course is an integrated part of the project and a precondition for participation in the project examination for those who are not acquainted with the Aalborg PBL model. Consequently, no diploma will be issued for the course nor will it appear on the academic transcripts. The assessment is pass/fail.

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

Title:
Sound Processing
(Lydprocessering)

Objectives:
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.

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

Knowledge:

- **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:

- **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.

Competencies:

- **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 format: 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.
Evaluation criteria: The criteria for the evaluation are specified in the Joint Programme Regulations.

Title:
Machine Learning for Media Technology
(Machine learning i medieteknologi)

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.

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

Knowledge:

- **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:

- 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.

Competencies:

- **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 format:
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.
Evaluation criteria: The criteria for the evaluation are specified in the Joint Programme Regulations.

Title:

Music Perception and Cognition
(Musikperception og -kognition)

Objectives:
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.

Students who complete this course must gain the following knowledge, skills and competencies.

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:
- **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.

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 format:
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.

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

Title:
Realtime Interaction and Performance
(Realtidsinteraktion og -udførelse)

Prerequisites:
The module adds to the knowledge obtained in the 1st semester

Objectives:
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.

Knowledge:

- **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:

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

Competencies:

- **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 format:
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.

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

Title:
Sound and Music Signal Analysis
(Analyse af musik- og lydsignaler)

Prerequisites:
The module adds to the knowledge obtained in the 1st semester

Objectives:
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.

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

Knowledge:

- 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:

- 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:

- 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 Format:

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

Semester project:
Sound and Music Information Research
(Informationsøgning i lyd og musik)
Semester: 2nd semester

Prerequisites:
The module adds to the knowledge obtained in the 1st semester

Objectives:
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.

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

Knowledge
- 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
- 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.

Competencies
- 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 format:
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.
Evaluation criteria: The criteria for the evaluation are specified in the Joint Programme Regulations.

Semester project:
Sonic Interaction Research
(Sonisk interaktion)
Semester: 2nd semester

Prerequisites:
The module adds to the knowledge obtained in the 1st semester

Objectives:
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.

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

Knowledge:
- 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:
- 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.

Competencies:
- 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 format:
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.

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

Title:
Algorithms, Data Structures and Software Engineering for Media Technology
(Algoritmer, datastrukturer og software engineering for medieteknologi)

Prerequisites:
The module adds to the knowledge obtained in the 1st semester

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).

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

Knowledge:
- 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:
- 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.

Competencies:
- 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 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: 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.

Title:
Modelling Physical Systems
(Modellering af fysiske systemer)

Objectives:
The module gives an in-depth introduction to modelling of physical systems and the analogies between dynamics systems such as mechanical, hydraulic, 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 the basics of mechatronic systems and the analogy between various dynamic systems.

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

Knowledge:
- Must have **knowledge** about the kinematics of particles
- Must have **knowledge** about the kinetics of particles
- Must be able to **understand** the analogy between various dynamic systems, i.e. electronic, mechanical and hydraulic systems
- Must be able to **understand** how to model the kinematics and kinetics of simple mechanical systems

Skills:
- Must be able to **apply** knowledge to the creation of free body diagrams of dynamic systems
- 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 hydraulic systems

Competencies:
- 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 hydraulic 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 format:
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.

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

Title:
Human Sound Perception and Audio Engineering
Menneskets lydopfattelse og audio teknik
http://www.sict.aau.dk/digitalAssets/101/101028_49303_akustik-og-audioteknologi-kandidat.pdf

Objective:
After completion of the course the student should

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)
- Basic knowledge in 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

Competencies:

- 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 the introduction to Chapter 3.

Exam format:
Oral or written examination.

Evaluation criteria:
As stated in the Joint Programme Regulations

Title:
Embodied Interaction
(Legemliggjort interaktion)

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).

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

Knowledge

- 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

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

Competences

- 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 format:
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

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

Semester project:
Sound and Music Innovation
(Innovation i lyd og musik)
Semester: 3rd semester

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

Objectives:
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.

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

Knowledge:
- 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:
- 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

Competencies:
- 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 format:
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.

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

Title:
Research in Sound and Music Computing
(Studier i lyd og musik)

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

Objectives:
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.

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

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

Skills:
- 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.

Competencies:
- 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 format:
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.

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

Title:
Multimodal Perception and Cognition
(Multimodal perception og kognition)

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 specialization profile chosen by the student (Computer graphics, Sound and music, Interaction, Games).

A student who completes the course module will obtain the following qualifications:

Knowledge:
- **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:
- 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.

Competencies:
- 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 **analyze** 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 format: 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.
Evaluation criteria: The criteria for the evaluation are specified in the Joint Programme Regulations.

Title:
Prototyping and Fabrication Techniques
(Prototyping og fremstillingsteknikker)

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.

Students who complete the module must acquire the following knowledge, skills and competences:

Knowledge:
- 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:
- 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

Competencies:
- The student must be able to **analyze** a problem, design a solution and translate it into a rapid prototyping design
- The student must be able to **analyze** 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 format:
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/Non-Pass grade.

Evaluation criteria:
Are stated in the Joint Programme Regulations.

Title:
Applied Experimental Psychology and Psychophysics
Anvendt eksperimentalpsykologi og psykofysik (only offered in Aalborg)
http://www.sict.aau.dk/digitalAssets/101/101028_49303_akustik-og-audioteknologi-kandidat.pdf

Prerequisites:
Basic statistics and probability theory

Objective:
After completion of the course the student should

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:
The students must be able to:

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

Competencies:

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

Type of instruction:
Lectures followed by exercises and lab-work.

Exam format:
Oral or written examination

Evaluation criteria:
As stated in the Joint Programme Regulations

Project-Oriented Work in a Company
(Projektorienteret forløb i en virksomhed)
Workload: 30 ECTS
Semester: 3rd semester

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

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

Objectives:
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.

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

Knowledge:
- 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:
- 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

Competencies:
- 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 format:
Oral examination on basis of a submitted Company Stay Report. Assessment: pass/fail..

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

Master's Thesis
(Kandidatspeciale)
Semester: 4th semester

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

The master thesis can 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.

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

Knowledge:
- 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:
- **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.

Competencies:
- 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 format:
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.
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 Techbical Faculty of IT and 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 2018 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 Master's thesis

In the assessment of all written work, regardless of the language it is written in, weight is also given to the student's spelling and formulation 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 Master's thesis must include an English summary.[4] If the project is written in English, the summary must be in Danish.[5] The summary must be at least 1 page and not more than 2 pages. 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 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.

5.4 Exemption

In exceptional circumstances, the Board of Studies study 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.

5.5 Rules and requirements for the reading of texts

At programmes 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

[4] Or another foreign language (upon approval from the Board of Studies.
[5] The Board of Studies can grant exemption from this.

European languages. At programmes taught in English, it is assumed that the student can read academic text and use reference works, etc., in English.

5.6 Additional information

The current version of the curriculum is published on the Board of Studies' website, including more detailed information about the programme, including exams.