



Speech and Music Communication

Study plan for third-cycle subject

The subject plan was approved by Fakultetsnämnden (Faculty Board) November 30, 2010. Valid from Spring 11.

Subject title

Speech and Music Communication (tal- och musikkommunikation)

Subject description and programme outcomes

Scientific field

The subject Speech and music communication encompasses scientific studies of human communication primarily by means of acoustic signals such as speech or music. Also communication by means of visual signals, for example facial gestures and body movements during speech or music, is included in the subject. The field includes descriptions, theories, models and technical systems covering all aspects of the communication chain from production, acoustic transfer, and transformation via hearing to perception, understanding and experience.

Description of possible specialisation

1. Speech communication
2. Music acoustics

Specification of how the programme outcomes are to be achieved

Speech communication

Description of the specialisation

Speech communication encompasses the theory of speech communication processes and applications within information technology, telecommunications and also within a number of medical specialities and aids for the handicapped.

Current research

Speech technology that includes applications of speech communication is under fast development and has grown to a new interdisciplinary research domain with its roots mainly in linguistics, speech communication research and computer science. Examples of research areas are: multi-modal speech synthesis, automatic speech recognition, speaker verification, multi-modal dialogue systems and more application-oriented systems and methods related to e.g. language learning and different disabilities. Any one of these areas comprises a suitable subject for a thesis. Thesis related research is often associated with the Centre for Speech Technology (CTT), a competence centre for cooperation between academia and industry. Basic research in speech production, acoustics of speech, speech perception and analysis of voice quality is also carried out at the department and can constitute a suitable thesis subject.

Programme structure

The education can be completed with Degree of Licentiate or Degree of Doctor. Education for third-cycle studies comprising a total of 120 credits for Degree of Licentiate and 240 credits for Degree of Doctor consists of coursework and thesis work. The coursework includes for Degree of Licentiate 35-50 credits and for Degree of Doctor 60-90 credits. KTH's local regulations for education for third-cycle studies regulate how first-cycle courses may be included in the degree. The reason for any individual deviations to these regulations must be specified in the individual study plan. Courses for first-cycle studies can only be included if these are essential for the individual thesis subject or give an interdisciplinary expansion of the research area. Deviation from the suggested number of credits can occur in the case of extraordinary circumstances. Courses for third-cycle studies can be given in the form of lectures, seminars, reading assignments and project assignments. The courses for each individual doctoral student are established individually in consultation with the head of the subject area and the principal supervisor. An individual study plan should be established and updated normally once a year. The study plan should convincingly show how the aims for the doctoral student's third-cycle studies can be achieved within available time. Doctoral students should, during their education, take part in and contribute to the scientific activity that is carried out at the department by attending seminars and give normally a seminar a year about their thesis work.

Compulsory and recommended courses

In the coursework must be included elements of theory of knowledge and research methodology. In the coursework may be included courses with a specialisation in teaching and learning in higher education. Such courses are, however, a requirement if teaching within the first and second cycle education should take place during the studies.

The courses Basics of Speech and Hearing (F2F5113) and Theory of Speech Communication (F2F5115) are compulsory for both licentiate and doctoral students. Other courses are defined and chosen individually. Some of these courses are described below.

Due to the interdisciplinary nature on the studies, doctoral and undergraduate courses at other universities can be included in the coursework. Especially courses in Phonetics and Linguistics can often be a good complement to the courses in Speech Communication.

Compulsory courses

F2F5113 Basics of Speech and Hearing, 15 credits.

Basics of speech and hearing Physiology of speech and hearing. Signal structures in different parts of the human speaker/listener speech chain. Coding mechanisms.

F2F5115 Theory of Speech Communication, 15 credits.

Theory of speech communication. Information theory, linguistics and phonetics as theoretical ground for speech communication. The speech code. Special emphasis is placed on such aspects of speech communication which have particular importance for automatic speech understanding and speech synthesis.

Courses recommended optional

F2F5112 Special Course in Signal and Circuit Theory, 15 credits.

Special course in signal and circuit theory. Signal processing methods for speech analysis and speech recognition. Models for speech production by means of for example transmission lines.

F2F5114 Advanced Course in Speech and Hearing, 7.5-22.5 credits.

Advanced course in speech and hearing. Problems with complexity and variability.

Interaction. Auditory transformations in relation to the speech code.

F2F5116 Advanced Course in Speech Communication Theory, 7.5-22.5 credits.

Advanced course in speech communication theory. Text analysis, parsing, problems with lexical access. Relationships between prosodic and segmental features. Speaker-specific features and speaking style variations.

F2F5117 Speech Communication Systems, 15 credits.

Speech communication systems. The use of speech communication models in speech technology systems, e.g. speech-based dialogue systems. Design criteria and performance. Evaluation of speech intelligibility and speech quality Effect of room acoustics and limitations in the ability of the speaker /listener Speech based dialogue systems. Applications within for example information technology, telecommunications, education and aids for the handicapped.

Thesis

The work with the thesis or the licentiate thesis should be started as soon as possible after the third-cycle studies have been started. The subject for the thesis should be chosen in consultation with the head of the subject area and principal supervisor, and should connect to the ongoing research at the department.

The thesis or the licentiate thesis is a compulsory part of the education for third-cycle studies. This part of the education aims at developing the student's ability to give independent contributions to research and cooperating to scientific studies within and outside his/her own subject. The thesis or the licentiate thesis should contain new research results that the student has developed alone or in collaboration with others. The main scientific results should satisfy the quality requirements for publication in internationally recognised journals using a peer review system. The student's own contribution to texts in a thesis having several authors shall be separately defined

The thesis or the licentiate thesis should normally be written in English. It can either be designed as a compilation of scientific articles or as a monograph thesis. In the previous case, there should be a dedicated written summary.

Irrespective of if the thesis is intended to become a monograph or compilation thesis, international publication of achieved results should be sought during the doctoral studies.

Music acoustics

Description of the specialisation

Music acoustics encompasses theories of the musical communication process: composer- musicians- listeners.

Current research

Research and related applications lie primarily within the following areas: music instrument analysis and design, vocology, music informatics, music technology, audio reproduction, nonverbal communication through sound, and music and voice pedagogy. Central subjects comprise theories for sound generation in musical instruments (including the singing voice) and models of music perception.

The structuring of sound sequences on several levels in the music communication chain is another important subject area. Music acoustics is therefore a strong interdisciplinary subject.

The education for third-cycle studies should further lead to a deepened understanding of music as both an acoustic and psychological phenomenon.

Programme structure

The education can be completed with Degree of Licentiate or Degree of Doctor. The coursework includes for Degree of Licentiate 35-50 credits and for Degree of Doctor 60-90 credits.

KTH's local regulations for education for third-cycle studies regulate how first-cycle courses may be included in the degree. The reason for any individual deviations to these regulations must be specified in the individual study plan. Courses for third-cycle studies can be given in the form of lectures, seminars, reading assignments and project assignments. Independent literature studies comprise the most important part of the course work and are to be chosen individually in consultation with the supervisor.

An individual study plan should be established and updated normally once a year. The study plan should convincingly show how the aims for the doctoral student's third-cycle studies can be achieved within available time.

Doctoral students should, during their education, take part in and contribute to the scientific activity that is carried out at the department by attending seminars and give normally a seminar a year about their thesis work.

Compulsory and recommended courses

In the coursework must be included elements of theory of knowledge and research methodology. In the coursework may be included courses with a specialisation in teaching and learning in higher education. Such courses are, however, a requirement if teaching within the first and second cycle education should take place during the studies.

The courses Acoustics (F2F5210), Auditory Perception (F2F5211) and Room Acoustics (F2F5205) are compulsory for both licentiate students and doctoral students. Other courses are defined and chosen individually.

Compulsory courses

F2F5210 Acoustics 7.5-15 credits.

The main fields of study of the classical acoustics: the wave equation, oscillations in strings, pipes, membranes, rods and plates.

F2F5211 Auditory Perception 7.5-30 credits.

Physiology of hearing, perception, the representation of signals in the peripheral auditory system, binaural hearing and localisation.

F2F5205 Room Acoustics 7.5 credits.

Sound fields in rooms, ray tracing, wave-theoretical and statistical models.

Optional courses

F2F5212 Instrument acoustics 7.5-30 credits.

The science about the acoustic function of the most common instruments: excitation principles, feedback in resonator systems, radiation properties.

F2F5214 Musicology 7.5-15 credits.

Fundamentals of harmony, counterpoint and elementary composition. Also other optional courses can occur.

FDT3230 Statistical methods for the behavioural science 7.5-10 credits.

Basic statistics, categorical data, tests of means, correlation and regression, analysis of variance, multiple regression.

Thesis

The work with the thesis or the licentiate thesis should be started as soon as possible after the third-cycle studies have been started. The subject for the thesis should be chosen in consultation with the subject responsible person and principal supervisor, and should connect to the existing research at the department.

The thesis or the licentiate thesis is a compulsory part of the education for third-cycle studies. This part of the education aims at developing the student's ability to give independent contributions to research and cooperating to scientific studies within and outside his/her own subject. The thesis or the licentiate thesis should contain new research results that the student has developed alone or in collaboration with others. The main scientific results should satisfy the quality requirements for publication in internationally recognised journals using a peer review system. The student's own contribution to texts in a thesis having several authors shall be separately defined. The thesis or the licentiate thesis should normally be written in English. It can either be designed as a compilation of scientific articles or as a monograph thesis. In the previous case, there should be a dedicated written summary. Irrespective of if the thesis is intended to become a monograph or compilation thesis, international publication of achieved results should be sought during the doctoral studies.

Entry requirements and selection

General and special admission requirements and prior knowledge

General entry requirements are defined by general regulations established by National the Agency for Higher Education and KTH centrally.

Selection rules and procedures

The selection is made among the applicants who satisfy the entry requirements. At the selection, the grade of the applicant's maturity, ability to independent assessment and critical analysis constitute important aspects. Strong emphasis is placed at learning outcomes in advanced courses or in the form of individual projects such as the degree project. Furthermore, the head of the subject or a selected teacher should have accepted the responsibility as supervisor for the student.

The programme's degrees and examinations

Degree of Licentiate and Degree of Doctor (PhD)

Degree of Licentiate and Degree of Doctor are to be taken in accordance with KTH's general rules.

The programme's examinations

No other compulsory tests are included in the education.