TEACHING

Sten Ternström
Director of
undergraduate studies

Undergraduate level

The undergraduate courses given by the department are mostly aimed at the last two years of the Master of Science (civilingenjör). All courses but two belong to the pool of optional courses that undergraduate students select from for their specialisation. The students are usually from the M.Sc. programmes Electrical Engineering, Computer Science and Engineering, or Engineering Physics.

The undergraduate teaching activity at the department is in a period of expansion. A new course in Media Technology Fundamentals was given in 2001 for the second time. This is a large compulsory course for second-year students in the Media Technology programme. It is co-ordinated by TMH and taught by several cooperating departements. In response to the needs of Media Technology, TMH is also preparing a major/minor four-course package of 20 credits in the general area of Sound, which is expected to start operating in the autumn of 2002. Another newcomer is a compulsory course in formal project management that is now taken by all first-year students in Electical Engineering. Together with all other "electrical" departments at KTH, TMH participates in this course as a project owner.

As part of the M.Sc. degree the undergraduates are required to complete a thesis amounting to five months of full time work. In 2001, 15 students finished their theses at TMH. These included several visiting students from other universities.

2F1111 Speech technology (4 cr)

32 students

Inger Karlsson

Elements of linguistics and phonetics applied to speech transmission and communication. Speech signal analysis and processing. Acoustic theory of speech production, implementation in speech synthesis. Auditory functions and perception of speech. Automatic speech recognition and text-to-speech conversion. Speech quality and intelligibility assessments. Automatic speaker verification. Text-to-speech and speech-to-text in systems for human-computer interaction, especially multi-modal dialogue systems.

2F1212 Music acoustics (4 cr)

22 students

Erik Jansson

Elements of acoustics including wave propagation, electro-mechanical analogies, strings, membranes, tubes. Fourier transform and elements of auditory theory. Design and function of musical instruments. Musical scales. Music generation and performance rules. Elements of room acoustics. Synthesis of instrument and voice.

2F1400 Electro acoustics (4 cr)

37 students

Johan Liljencrants

General theory of sound waves. Auditory functions and perceptual limitations. Analogies between electrical, mechanical, and acoustic systems. Acoustical impedance. Basic equations for electro-mechanical four-terminal systems. Loudspeakers, microphones. Sound-recording techniques. Ultrasound. Measurement techniques.

2F1510 Pattern recognition (4 cr)

41 students

Arne Leijon

Classical Bayesian decision theory, signal classification in additive white Gaussian noise, matched filter design, parameter estimation and supervised learning, non-parametric classification techniques, linear discriminant functions, and an introduction to neural network design. These concepts and methods are extended to the classification of pattern sequences using the Hidden Markov Model. Human communication by speech and hearing in the framework of signal classification theory.

2F1520 Digital speech compression

15 students

Bastiaan Kleijn

Abstract: The course treats current speech-coding technology by means of laboratory exercises, projects, and lectures. It provides hands-on experience with the application of signal processing methods.

Goal: To provide a good understanding of current speech coding technology and to provide practical experience in signal processing.

Syllabus: Classification and overview of speech coders, overview of speech-coding standards. Uniform, nonuniform, and adaptive quantization. Pulse code modulation and adaptive pulse code modulation. Vocoders which use models of the vocal tract and its excitation. Waveform coding techniques including differential PCM, adaptive DPCM and delta modulation. Analysis-by-synthesis coding methods including multi-pulse LPC, RPLPC, and CELP. Subband and transform coding. Sinusoidal coding and waveform interpolation. Detailed description of several current speech-coding standards including the GSM speech-coding algorithm.

2F1531 Information theory and source coding (5 cr)

14 students

Bastiaan Kleijn

The course treats the principles of the encoding of speech, audio, video, and images at low bit rates. Source coding techniques such as scalar and vector quantization, orthogonal transforms, and linear prediction are introduced and their performance is analyzed theoretically. The theoretical bounds on the performance of source coders are discussed.

2D1574 Media technology, basic course (12 cr)

27 students

Sten Ternström

An introduction to media engineering, including text and print, still photography, moving pictures, and sound. The course provides basic knowledge on human visual and auditory perception, techniques and production methods relevant to each medium, requirements for data rates and volumes, and an ability to communicate effectively with specialists in the respective areas. Several departments cooperate on this course. TMH is coordinator and supplies the sound section.

2F1700 Electrical Engineering Project Management (5 cr)

30 students

Inger Karlsson

In this course, groups of 4-5 first-year students learn to plan, execute and evaluate a minor development project in the way a consultancy might operate. This course is administered by Industriella Styrsystem and gives all students in Electrical Engineering an opportunity to make contact with department research at an early point in their training. The course made its debut in 2001 and was much appreciated by students and departments alike. Of some 30 projects, six were done at TMH in 2001.

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