Tækniskólinn
skóli atvinnulífsins

Acoustics H-HLT

The study programme

Admission requirements

Students must have completed a minimum of 100 credits (ECTS) from an upper secondary school and at least 6 credits in mathematics, English and Icelandic. Preferably students should have some musical education or experience from playing in an orchestra or a band.

Upon completion of the study!

Students who have acquired this knowledge are employed as sound engineers for the broadcast media. This includes audio recordings as well as radio and television broadcasts and online newspapers and magazines. They also work in sound studios at recording, post production and dubbing as well as recording live bands and various other events for releasing or broadcasting live. Webcasting is gaining great popularity and with the increasing bandwidth of the Internet, the possibilities for its use are multiplying, creating a greater need for more technicians. Various picture processing services call for technicians for example when transferring images, duplicating, copying and assisting customers. Cinemas, advertising agencies, churches and hotels need people who possess this knowledge. Students who have graduated from the acoustics study programme have a good insight into marketing and have an advantage when launching a project on the market, directing the recording and releasing of music and also when organising and giving concerts. A great number of musicians seek knowledge in recording and post production in order to professionally build up and develop their own bands or music. The options for marketing music are great, both domestically and internationally.

The arrangement of the study programme

The acoustics study programme is organised according to the final requirements for knowledge and competence, which are set by professional sound engineers working in the business. A great deal of work experience is required as this study programme is based on a considerable amount of training. Students of acoustics have to have a good insight into the theory of electronics because all sound is produced electronically. They also have to have a good grasp of music and music theory. Acoustics is also an important part of the study; covering the behaviour of sound. Furthermore, acoustics must be approached mathematically. Those who want to make a career in the music business also need to know how the market works. Therefore, business management is a part of the study programme.

Objectives

To provide education in acoustics and audio production that is comparable with the best in the world. To graduate students with a solid knowledge of the principles of audio recording and acoustics and who are well trained in audio recording and audio production. Students should have a solid knowledge of the theory of sound electronics and know the principles of digital technology from analogue/digital converters to compression standards and streaming. They should have a reliable knowledge of music theory and know well the behaviour of sound and its principles. Students should be well acquainted with the principal equipment and tools that are used for audio recordings and production and should be able to record the spoken word and prepare for broadcast as well as record an orchestra.

The student acquires knowledge of …

- Most key terms used in acoustics, in Icelandic as well as in English
- The theory of electronics which is the basis of acoustics
- The Decibel scale, its fundamentals and various implementations
- Acoustics, the physics of sound and understand the principles of room acoustics
- The principal musical instruments and their acoustic behaviour
- Music theory and is able to read music
- Audio production in a studio
- Audio production in the broadcast media
- Audio production in webcasting
- Business management of audio production and the key markets
- Funds and grants

The student has the competence to …

- Record sounds; the spoken word, music or high quality sound effects
- Mix and prepare music for broadcast or album release
- Compose music using multi-track audio production software
- Recognise high quality sound from low quality, regardless of fashion trends
- Organise a recording and be able to estimate the need for equipment for each project
- Set up sound systems for concerts
- Work professionally and co-operate with professional people in various fields
- Make an operational plan for recording, production and/or releasing
- Take part in the marketing of a company or a product

The setup of the acoustics study programme

Course unit	Total hours	1st semester	2nd semester	3rd semester	Credits (ECTS)
Acoustics HLF	84	84			4
Theory of sound electronics HRF	210	**105**		**105**	10
Music theory and relative pitch HTF	210	**105**	105		10
Recordings HUT	336	**112**	**112**	**112**	16
Audio production HLV	336	**112**	**112**	**112**	16
Composition HTL	210	**105**	**105**		10
Business management HRE	105			105	5
Dubbing HHS	399		**199,5**	**199,5**	19
Total hours:	**1890**	623	633,5	633,5	
Total credits (ECTS):					**90**

NQF 3
NQF 4

The acoustics study programme is for the most part organised on the third and fourth levels as the students have to have considerable experience in audio production or playing a musical instrument. The study programme is comparable to diploma study programmes in other countries and belongs therefore in most cases to level four.

Level two to four conform to the National Qualification Framework (NQF) and the acoustics study programme is on levels NQF 2-4.

NQF conforms to the European Qualification Framework (EQF) and the acoustics study programme is on levels EQF 3-5.

Course description - Acoustics

Course name: Acoustics, microphones, the history **Acronym:** HLF

Total number of credits (ECTS): 4 Total number of hours: 84 Number of phases: 1

Number of hours in phase 1: 84 Number of hours in phase 2: Number of hours in phase 3:

Prerequisites: 60 credits from an upper secondary school with a minimum of 6 credits in English, Icelandic and mathematics.

Final objective of the course:

Students understand the physics of sound and the behaviour of sound and how different types of microphones convert sound into electrical signals. Students understand terms such as phase-shift, projection and reverberation and the difference in the speed of sound in various materials. Students have understood the effects of sound (under and over the audible frequency range).

Description of the topic of the course on level 3 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
The physics of sound, the structure of various transducers in microphones and how sounds are converted into electrical signals. The different types of microphones and how their characteristics are presented in the product information. The audio function of the ear and the brain. Electronic noise ratio, amplitude ratio, noise endurance, pain threshold.

The student acquires competence to:
Calculate wavelength from frequency and explain terms such as self-resonance in musical instruments, how sound travels, how the ear detects sound and how the brain converts sound into electronic signals.

The student acquires competence to:
Select and install microphones for musical instruments for the best possible recording. Choose the best method and the optimum conditions for recording.

Course description - Acoustics

Course name: Theory of sound electronics **Acronym:** HRF

Total number of credits (ECTS): 10 Total number of hours: 210 Number of phases: 2

Number of hours in phase 1: 105 Number of hours in phase 2: 0 Number of hours in phase 3: 105

Prerequisites: 60 credits from an upper secondary school with a minimum of 6 credits in English, Icelandic and mathematics.

Final objective of the course:

The students know Ohm's Law, can calculate voltage, current, resistance and power from given or measured values and know Watt's Law on power and can calculate the power on an audio cable. The students know the Decibel scale from voltage, power or currents. The students know the main terms used in the theory of electronics related to sound and audio production and the difference in VU versus PPM audio metering. The students know the correct way of connecting audio cables to prevent ground loop (RCA, XLR, jack etc.). The students understand the importance of a balanced signal, using two phase audio cables. The students know the major sources of electrical noise and disturbances in the environment. The students know the principles of logic circuits, the binary code. The students know the functions of A/D converters, sampling rate and bitrate. The students understand the importance of sampling rate and bitrate in sampling. The students know PCM coding and principal compression standards. The students are familiar with digital audio cables and distortion problems. The students are familiar with different means of digital storage such as CD and DVD; jitter due to poor quality of cables, connectors or clock and DAT recorders and their structure.

Description of the topic of the course on level 2 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Terms related to voltage, current, resistance, impedance, power and energy. Faraday's span law, the Decibel scale, VU and PPM audio metering. Analogue signal transmission.

The student acquires skills to:
Measure current, voltage and resistance. Measure sound intensity and calculate it in decibels. Convert between VU and PPM scales. Solder XLR connectors and cables.

The student acquires competence to:
Repair audio cables, set up an analogue studio. Diagnose malfunction.

Description of the topic of the course on level 3 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Digital recording, the binary code, A/D converters, the principles of digital recording and compression. The PCM code.

The student acquires skills to:
Record sound from a microphone directly into a digital recording equipment without distortion. Compress for different media.

The student acquires competence to:
Repair audio cables for digital transfer of signals, set up a digital studio. Diagnose malfunction.

Course description - Acoustics

Course name: Music theory and relative pitch **Acronym:** HTF

Total number of credits (ECTS): 10 Total number of hours: 210 Number of phases: 2
Number of hours in phase 1: 105 Number of hours in phase 2: 105 Number of hours in phase 3: 0

Prerequisites: 60 credits from an upper secondary school with a minimum of 6 credits in English, Icelandic and mathematics.

Final objective of the course:

The students can read sheet music in order to follow the playing of an orchestra, soloist or singers and tag the recording.

Description of the topic of the course on level 2 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Sheet music and most musical instruments as well as musical scales.

The student acquires skills to:
Read sheet music with a soloist or one musical instrument.

The student acquires competence to:
Follow sheet music of singing or single instrument to insert cues or tags.

Description of the topic of the course on level 3 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Sheet music and most musical instruments as well as musical scales.

The student acquires skills to:
Read sheet music to follow the playing of an orchestra.

The student acquires competence to:
Follow sheet music of the playing of an orchestra in order to insert cues or tags and change the mixing or the emphasis in the recording.

Course description - Acoustics

Course name: Recordings **Acronym:** HUT

Total number of credits (ECTS): 16 Total number of hours: 336 Number of phases: 3

Number of hours in phase 1: 112 Number of hours in phase 2: 112 Number of hours in phase 3: 112

Prerequisites: 60 credits from an upper secondary school with a minimum of 6 credits in English, Icelandic and mathematics.

Final objective of the course:

The students know all the major types of microphones and can select the appropriate microphone for each situation. The students can use simple recording equipment both inside and outside a studio. The students know how to connect the various devices to peripheral equipment. The students can record sound in difficult situations. The students can do audio production in a multi-track programme. The students can apply most sound effects in audio production. The students can record sound simultaneously into many audio tracks. The students can prepare an audio production and know the mastering process prior to a release.

Description of the topic of the course on level 2 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Microphones, peripheral equipment, recording equipment both digital and analogue.

The student acquires skills to:
Set up equipment for recording, digital or analogue.

The student acquires competence to:
Make high quality recording of any sound such as instruments, singing, the spoken word, sound effects etc.

Description of the topic of the course on level 3 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Audio recording equipment of various kinds, different microphones and different kinds of peripheral equipment.

The student acquires skills to:
Assess and communicate which equipment is suitable for each situation. Select equipment for recording, set it up and record.

The student acquires competence to:
Manage a recording outside as well as inside a studio, with the appropriate equipment and record a classical orchestra, alone or in cooperation with others.

Course description - Acoustics

Course name: Audio production **Acronym:** HLV

Total number of credits (ECTS): 16 Total number of hours: 336 Number of phases: 3

Number of hours in phase 1: 112 Number of hours in phase 2: 112 Number of hours in phase 3: 112

Prerequisites: 60 credits from an upper secondary school with a minimum of 6 credits in English, Icelandic and mathematics.

Final objective of the course:

The students learn to use any kind of audio recording equipment. The student can record, mix, use sound effects and fully process sound in a programme such as ProTools pro. The student is equally capable of audio recording with digital as well as analogue equipment and can process sound with both methods. The student can use computers in an organised way, knows how to copy, tune, edit, restore and beat detect etc. before turning in his projects to others.

Description of the topic of the course on level 3 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Digital recording equipment, major terms used in audio recording, processing and adding sound effects.

The student acquires skills to:
Use equipment in a systematic way in production and playback. Record and process a multi-track recording and forward it to additional or final processing.

The student acquires competence to:
Work with a producer at audio recording and production inside a studio or at a setting. Turn in an audio production, in raw format or compressed.

Description of the topic of the course on level 4 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Digital and analogue recording equipment and processing equipment for recording and complete processing of sound.

The student acquires skills to:
Record, edit, mix, apply special effects and turn in a completely processed sound either in an analogue or digital form.

The student acquires competence to:
Set up recording equipment according to the producer's specifications and record and process sound inside or outside a studio.

Course name: Composition **Acronym:** HTL

Total number of credits (ECTS): 10 Total number of hours: 210 Number of phases: 2

Number of hours in phase 1: 105 Number of hours in phase 2: 105 Number of hours in phase 3: 0

Prerequisites: 60 credits from an upper secondary school with a minimum of 6 credits in English, Icelandic and mathematics.

Final objective of the course:

The student is introduced to and is able to compose music using digital equipment. The student gets an insight into the world of electronic music and can use equipment such as multi-track audio recording equipment to make sequences to use in music. The student learns to use a sampler, a sequencer, a synthesiser and other specialised software.

Description of the topic of the course on level 3 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Digital audio production equipment for making special effects. Equipment for audio production such as audio generator or function generator.

The student acquires knowledge of and:
Can use equipment systematically to make tones and sounds and is also able to record and playback.

The student acquires competence to:
Compose music with special effects.

Description of the topic of the course on level 4 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Digital and analogue audio production equipment for making special effects. Equipment for audio production such as audio generator or function generator.

The student acquires knowledge of and:
Can compose five minutes of music with special effects mixed with instruments.

The student acquires competence to:
Compose music with special effects mixed with instrumental playing and recording of various sounds.

Course description - Acoustics

Course name: Business management **Acronym:** HRE

Total number of credits (ECTS): 5 Total number of hours: 105 Number of phases: 1

Number of hours in phase 1: Number of hours in phase 2: Number of hours in phase 3: 105

Prerequisites: 60 credits from an upper secondary school with a minimum of 6 credits in English, Icelandic and mathematics.

Final objective of the course:

The students learn about the business environment of the sound industry. The students get an insight into the history of the music industry, how it has developed in the last century and they learn about the major music businesses, in Iceland as well as internationally. The students learn about the key opportunities in the business, its current challenges and where likely opportunities can be found. The students get a solid knowledge in marketing in order to be able to market music domestically as well as internationally. The theory of advertising is introduced as well as the possibilities of the internet. Technical development in the sound industry is analysed as well as the analogue and digital possibilities. Music in the computer game industry is studied. Matters concerning rights are looked into as well as regulations and laws regarding copyright. The role of STEF (the Icelandic Copyright Bureau), contracts and regulations of the music industry with respect to music, music in advertising, film scores etc. Business models for the domestic as well as international music business are studied. Marketing on different levels such as DVD sales, releases, concerts, licences and merchandise connected with the music and film industry. Future possibilities are considered with regard to a changing methodology and environment. The finances and the operation of a company is examined, looking into the theory of finance, accounting, statement of operations, balance sheet, cash flow, budgeting and making a budget for a record and a film.

Description of the topic of the course on level 3 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
The music and the film market and knows the tax laws in connection with releasing. Knows the history of the music business and the main jobs in the business. The major contracts in the music business. The Icelandic Copyright Bureau. The legal aspects regarding releasing.

The student acquires skills to:
Use spread sheets and software for accounting as well as tax settlement.

The student acquires competence to:
Make a marketing plan for a record, a concert, music or a film.

Course description - Acoustics

Course name: Dubbing **Acronym:** HHS

Total number of credits (ECTS): 19 Total number of hours: 400 Number of phases: 3

Number of hours in phase 1: Number of hours in phase 2: 200 Number of hours in phase 3: 200

Prerequisites: 60 credits from an upper secondary school with a minimum of 6 credits in English, Icelandic and mathematics.

Final objective of the course:

Main emphasis is placed on teaching the principles of dubbing films and TV shows. The students learn to record voices and dub them to film in sync. The students can also mix a soundtrack in mono and stereo. The students learn to use three dimensional sound and are introduced to Surround 5.1. The students learn about the demands for sound in cinemas and the difference in audio production for TV on the one hand and for cinema on the other.

Description of the topic of the course on level 4 (knowledge, skill, competence, acquire, analyse, communicate):

The student acquires knowledge of:
Audio recording and software for dubbing.

The student acquires skills to:
Use his knowledge to record sound and use sound effects to dub a short film, a cartoon or a film.

The student acquires competence to:
Work with actors at recording and audio production. Can dub a film with the spoken word, sound effects and music and turn it in using e.g. Dolby Surround 5.1 or the form requested by the cinemas and distribution companies.