



**Karolinska  
Institutet**

Course syllabus for

## **Signal theory, 7.5 credits**

Signalteori, 7.5 hp

This course has been cancelled, for further information see Transitional provisions in the last version of the syllabus.

Please note that the course syllabus is available in the following versions:

Spring2009 , Autumn2010 , Spring2012 , Spring2013 , Spring2014 , Spring2015 , Spring2016 , Spring2024

Course code	1AU011
Course name	Signal theory
Credits	7.5 credits
Form of Education	Higher Education, study regulation 2007
Main field of study	Audiology
Level	G1 - First cycle 1
Grading scale	Pass, Fail
Department	Department of Clinical Science, Intervention and Technology
Decided by	Programnämnden för audionomprogrammet
Decision date	2008-10-22
Revised by	Programnämnd 4
Last revision	2010-05-05
Course syllabus valid from	Autumn 2010

## **Specific entry requirements**

Specific eligibility according to The Programme syllabus of The Study Programme in Audiology 180 credits

## **Objectives**

The general aim of the course is to give the student basic knowledge of signals and systems, and an understanding of audiological applications of signal theory. Learning outcomes of the course On completion of the course the student should be able to describe signals' properties i time and frequency and explain the relationship between these descriptions, be able to apply knowledge how the energy distribution for broadband signals is calculated, relate this to the signal process properties of systems, be able to account for the bases in digital signal processing, and be able to describe the properties of linear and non-linear systems, relate these to hearing aids, and the sense of hear as signal process system, apply this knowledge, and be able to analyse recorded healthy by means of the fundamental concepts of signal theory.

# Content

The course is divided in two parts, see below. Part 1: Basic signal theory, 3 HE credits. The part gives basic knowledge of the representation of simple and complex signals in a time and frequency plan and about relations between the representations. The terminology from the basic physics tuition is extended. The concept of band is treated, including arithmetical rules for band level summation. The basic characteristics of digital signals are discussed. Part 2: Signals and systems, 4.5 HE credits. This part deals with the affect of systems on signals. Simple ideal systems such as filter are treated as well as real systems, both acoustic and electric. The ear is also brought up as an example of a system. Focus is on linear systems. Undesired non-linearity is treated, such as various types of distortion. The hearing aid as a signal processing system is introduced and, in connection with that, undesired non-linearity is discussed. An orientation is given, how to investigate the characteristics of different systems.

## Basic signal theory, 3.0 hp

Grading scale: GU

This part gives basic knowledge of the representation of simple and complex signals in the time and frequency domains and about relations between the representations. The terminology from the basic physics education is extended. The concept of band is treated, including arithmetical rules for band level summation. The basic characteristics of digital signals are discussed.

## Signals and systems, 4.5 hp

Grading scale: GU

This part deals with the affect of systems on signals. Simple ideal systems such as filters are treated as well as real systems, both acoustic and electric. The ear is also brought up as an example of a system. Focus is on linear systems. Undesired non-linearity is treated, such as various types of distortion. The hearing aid as a signal processing system is introduced and, in connection with that, undesired non-linearity is discussed. An orientation is given, how to investigate the characteristics of different systems.

## Teaching methods

Lectures, seminars and calculation exercises are interleaved with independent theoretical work and practically oriented laboratory sessions. Scheduled supervision is offered in connection with the laboratory sessions.

## Examination

Examination takes place through Part 1: Basic signal theory, 3 HE credits Oral presentation of a laboratory report Study assignments Written examination Part 2: Signals and Systems, 4.5 HE credits Written written assignments Oral presentation To pass the course, satisfactory attendance in compulsory parts (laboratory sessions and seminars) is also required. In case of absence from a compulsory part, the student gets an individual complementary assignment determined by the course coordinator. For student who does not have not passed the regular examination, are offered two renewed examinations in connection with the regular occasion. All in all, there is a possibility of six examinations, the last three of which are provided in connection with the next regular course.

## Transitional provisions

Examination may take place under the previous reading list during a period of one and a half years after the date of the renewal of the reading list. Examination will be provided during a period of three years

after a close-down of the course.

## **Other directives**

A study guide is distributed at the beginning of the course, comprising assessment criteria for examination, specific instructions for certain tasks, a timetable specifying compulsory parts, and a list of responsible teachers. Course evaluation will be carried out in accordance with the guidelines established by the Board of Education. Course evaluation is carried out both through a written evaluation at the end of the course, and through an oral forum at least once in connection with the course, where the students may express their opinions.

## **Literature and other teaching aids**