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1. Description of the course evaluation process

The group of students is usually small and there is a close rapport between students and teacher. The course has a home exam, and a questionnaire (see below) is distributed and handed in with the exam but anonymously. The questionnaire responses are compiled by myself. The final question concerns fair and equal treatment.

2. Description of meetings with students

Student opinions are solicited during the course and discussed at a mid-point workshop in conjunction with a progress report on the group assignment task. Several of the students are exchange students that return home at the Christmas break.

3. Course design

Learning activities include

- 13 double-hour lectures;
- 3 tutorial sessions;
- one or two field trips;
- one group assignment in groups of three students: write an in-depth article, *or* solve a set of fairly complex audio programming tasks. Good articles are accumulated from earlier course rounds and used as add-on literature in this course.
- 4 three-hour laboratories, with ears-on activities using audio equipment in studios (not computer labs);
- author a candidate problem for the exam, including a solution and marking criteria; good problems will appear on the actual exam; ex-exams are *not* made available (but probably circulate anyway...).
- complete a home exam which may involve a lot of independent literature research, to be handed in in January. Students report spending at least 10 hours on the exam.

4. Students' workload

The students usually report being kept quite busy and that the workload is evenly distributed across the course. The authoring of a usable exam problem is seen as particularly difficult but very instructive.

5. Students' results on the course

It is rare for students to fail this course; in 2020 no-one did. However, only 8 of 10 participating students completed the exam. Generally the motivation is very high and students invest many hours of work in the home exam, where creativity and integrity are encouraged. Grades tend to spread evenly from E to A. This year there were no E's. The background knowledge varies; those with no prior signal processing have a somewhat harder time.

6. Students' answers to open questions

7. Summary of students' opinions

The questionnaire with average scores and samples of compiled comments is given at the end of this document.

8. Overall impression

This is a specialized course that attracts highly motivated students with an interest in sound processing and sound reproduction. The ambience during the course is generally very good and positive, and much effort is invested in trying to keep everyone on board even though the pace through complex topics is rather high. The laboratories are highly appreciated. The assistants are persons who work with advanced audio on a daily basis, and they invariably receive very positive ratings and remarks – also in 2020.

9. Analysis

In 2020 twelve students were registered but ten participated actively. Since this was the first round for which there is no Sound track in the CMETE3 programme, we were concerned about getting low participation, but at least we had more than in 2019. Also this allowed us to raise the curriculum to Master programme level, as was originally intended when the course was first created.

International students sometimes do better thanks to a stronger background in signal processing.

10. Prioritized course development

The technology for audio is evolving rather rapidly. The somewhat dated section on optical storage of audio (CD, DVD etc) has been delegated to self-study, and instead we had a guest lecture by a professional in audio streaming from Spotify, as in the previous year.

11. Other information you want to share'

Adaptations to the pandemic: The first eight hours of the course are a module on spatial audio and surround sound. This module is normally taught by professor Damian Murphy, University of York, who visits us every year with support from Erasmus. (not sure what will happen after Brexit...) With the travel constraints in effect, Damian very kindly did these hours remotely from York. In the room Fantum, we have a surround sound system. We started in period 2 with hybrid lectures there, and we managed to convey some of the surround-feeling using a dummy-head microphone placed in the center of the room, played in binaural stereo over Zoom, while Damian controlled the sound system (and slides) remotely from York. The crowning component of this module is normally a lecture at KMH, under their spectacular loudspeaker dome, but sadly this had to be cancelled in 2020 due to the pandemic.

After this module, the pandemic constraints became more severe, so all lectures were made digital. This is somewhat challenging when sound is important, but ST has an ambitious setup in his home studio, and is able to run audio demos through Zoom. All the lectures in the course are available as videos in the Media

Gallery on Canvas. Unfortunately, Zoom stores the audio only in mono when recording, and Sten did not have time to edit the videos specifically for the sound.

The labs in this course require special equipment and are normally given in small rooms that are not suitable in a pandemic. However, the hands-on, ears-on experience that they give is an essential element of the course. We handled this by reducing the number of students per lab session from 3-4 to 1-2, mandating face masks and disposable gloves (provided), and ventilating and wiping down all equipment between sessions. This was appreciated by the students. One of the four labs (a listening test) was converted to an online format to be done at home, which was less than optimal but workable.

The course offers a lot of teacher time per student, since the labs only take three students at a time, in specially equipped rooms. This is a bit of a luxury, but it is tremendously appreciated and the free comments 'I learned a lot from the labs', 'the labs were great' always appear in the course evaluation.

(questionnaire responses are summarized on the next page)

Course assessment DT2410 Audio Technology 2020

Your anonymous response may be given in Swedish or English.

	Bad-Good	<i>Based on 8 responses; 8 took the exam</i>
Lectures	1-5 Means	Comments (Compiled)
<i>Damian Murphy</i> : spatial sound (3 sessions + tutorial)	4.7	[Hybrid in Fantum and on Zoom]
Analog-digital-conversion, 2 sessions + tutorial	4.4	
Audio IC's	3.7	
Software architecture (x 2)	3.9	
Audio coding/compression	4.4	
Connection and transmission	4.0	
<i>Rossholm</i> from Spotify, on streaming	4.6	
<i>Swedish Radio</i> : Audio in broadcasting	4.6	SR came to Zoom with a great team of four (!) people, several of whom are former CMETE students
Other, please specify:		"best pandemic adaptations possible"
Labs	1-5	Comment
A: The mixing console and outboard units	4.4	
B: Audio coding	3.8	"pity to have to do it at home"
C: Analytical listening and voice reproduction	4.1	
D: Spatial sound and virtual acoustics with Ambisonics	4.7	"it gave the intended experience" "one of the best labs I've been to"
Enough time? Would have needed more preparation? Function? Competent lab-assistants?	4.9	"Most fun labs we've ever had" "Good preparation material, enough time, super equipment" "Everything went fine even though I was alone."
Assignment	1-5	Comment
Clear directives?	4.6	
Access to materials/guidance?	5.0	
Cooperation in the group?	4.3	
General	1-5	Comment
Textbook: <i>Pohlmann</i> , Principles of Digital Audio, 6 th edition (or other)	4.0	
Curriculum: topics missing, or redundant topics?	4.3	
Did the course fit your prior knowledge?	4.5	
Did the exam reflect the course contents well?	4.6	
Overall disposition of the course	4.5	
Participants were treated fairly and without discrimination	5.0	
Other		