Course PM for Digital Signal Processing for Audio Engineering and Active Sound and Vibration Control, VTA132, 20-August-2024

Course Purpose

The course teaches fundamental methods in digital signal processing applicable in audio engineering and active noise and vibration. Audio signal processing is applied in both time and frequency domain and is ubiquitous in modern communication systems. The course also gives insight into various approaches for active control, the physics behind these approaches and their implementation.

Personnel

Examiner/lecturers: Jens Ahrens, phone: 031 772-2210, e-mail: jens.ahrens@chalmers.se

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Course Literature

Course materials will be available for download from the division's website at http://www.ta.chalmers.se/education/course-materials/digital-signal-processing-for-audio-engineering-and-active-sound-and-vibration-control/ as the course progresses. Contact the instructors to obtain the password.

Scheduling

Lectures, in-class exercises and laboratory work according to the schedule below. Find the detailed scheduling here: http://www.ta.chalmers.se/education/schedules/. The scheduling of the laboratory work is done in class. All activities take place at the lecture at Applied Acoustics, Sven Hultins gata 8A.

Week 1

L1 (DSP) Quantization

E1 (DSP) Quantization, sampling

Week 2

L2 (DSP) AD/DA conversion

E2 (DSP) Quantization

Week 3

L3 (DSP) Digital Filters

E3 (DSP) Digital Filters

Week 4

L4 (DSP) Digital Filters

E4 (DSP) Digital Filters

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Week 5

L5 (DSP) Measurement of LTI syst., Nonlinear systems, convolution, fast convolution

E5 (DSP) Fast convolution

Week 6

L6 (DSP) Filter inversion, Delays and resampling

E6 (DSP) Delays

Week 7

L7 (DSP) Dynamic range control

E7 (DSP) Dynamic range control

Week 8

L8 (DSP) Numerical optimization

E8 (DSP) Numerical optimization

Lab (ANC)

Week 9

Pause (exam week)

Week 10

L9 (ANC) Introduction to ANC

L10 (ANC) ANC in a duct

Week 11

L11 (ANC) Filters for ANC 1

L12 (ANC) Filters for ANC 2

Week 12

L13 (ANC) Active control of Vibrations

L14 (ANC) Active control of Vibrations

Week 13

L15 (ANC) Local Control

L16 (ANC) Active Control in Rooms

Week 14

L17 (ANC) LMS

L18 (ANC) INTRO LAB

Week 15

Lab (ANC)

Week 16

L19 (ANC) Active Control of Sources

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Summary of Modifications Since Previous Lecture Season

n.a.

Examination

Examination is based on 5 home assignments and a written report on the laboratory project work. The home assignments need to be submitted through Canvas within 12 days. Grading from all 5 home assignments is equally weighted to produce a grade for the DSP part. The ANC grade is based on the laboratory project report. The DSP grade and the ANC grade are weighted 60/40 to produce the final grade.

All 6 activities that the final grade is based on are mandatory and cannot be replaced by other activities.

For reaching grade 3, the student needs to achieve a score of at least 40 %. They should be able to carry out the tasks work in a proper methodological way. They should also be able to master the main contents of the lectures in an appropriate way.

For reaching grade 4, the student needs to achieve a score of at least 60 %.

For reaching grade 5, the student needs to achieve a score of at least 80 %. They should be able to carry out the project work in an excellent methodological way. They should also be able to show a deep understanding of the contents of the lectures.