

Sound and Vibration Measurement (SVM)

VTA073 1st and 2nd quarter 2017, 7.5 ECTS credits

Organisation: The organisation and content of lectures and exercises are shown in the list below. Please note that lecture attendance is compulsory! All lectures will be given in the division's teaching lab. Time and location of lab work will be announced as the course progresses.

Lecturers: Wolfgang Kropp, Jens Ahrens, Jens Forssén and others.

Course administrator and examiner: Jens Forssén (t: 031 772 8604, jens.forssen[at]chalmers.se).

Course literature: Six lab-instructions. Measurement standards and other material are found in the Division Library. Useful introduction material by B&K (Brüel & Kjær) can be downloaded from www.bksv.com, click *Library* and *Primers & Handbooks*.

Requirements for obtaining a passing grade, or grade 4 or 5:

- Attend the lectures
- Study the appropriate course material and lab notes prior to the lab work
- Carry out the preparatory homework tasks, which are to be handed in to the lab assistant before the start of each laboratory assignment (unless otherwise stated for the particular lab)
- Actively participate in the laboratory work
- Write a report. The reports should follow our *Guidelines for Writing a Report*, which can be found on the course home page. Also, for each lab, a discussion about errors/uncertainty should be included
- The pre-task shall be included in the lab report
- The grading is on a quarter scale (0, 0.25, 0.5, ..., 5.5), where ≥ 2.5 is a passing grade, grade 4 is between 3.5 and 4.5, and grade 5 is from 4.5 and above
- For passing the course, each lab report must reach a passing grade
- The total grade on the course is the rounded average of the lab reports.

Reports

Lab reports should be provided to the lab assistant no later than one week after the lab was made (except the last lab, which is counted as two labs and allows two weeks). One week later, the lab group and the lab assistant meet and review the lab report. This is the opportunity for the lab group to obtain information on the quality of the report and an indication on the possible grade after improvements. (The assistant decides, together with the lab group, the date for the meeting.) Note that a large increase is not to be expected from

first hand-in. A FINAL lab report is to be handed in at the latest one week thereafter. Check the web course pages for our guide to grading of lab reports.

Lab groups

The laboratory work is made in groups of four persons, the reports are written in groups of two (including the pre-task). This grouping is randomized for each lab. The lab assistant evaluates and suggests grades for the report.

Lectures (see common schedule for lecture times)

Quarter 1

Week 1 Lecture: Introduction. Principles of acoustic measurements. Guidelines for writing measurement reports (WK).

Week 1 Lecture: Measurement technique: microphones, loudspeakers, measurement environments (JA).

Week 2 Lecture for lab 1: Measurement of sound outdoors (GZ).

Week 2 Lecture: Measurement technique: microphones, loudspeakers, measurement environments, continued (JA).

Week 2 Lecture: Report writing (WK), Uncertainty estimates (JF).

Week 4 Lecture lab 2: Measurement of sound power (CA).

Week 7 Lecture lab 3: Measurement of airborne and impact sound insulation (WK).

Quarter 2

Week 2 Lecture lab 4: Signal processing (JA).

Week 4 Lecture lab 5/6: Basic vibration measurements & Vibration measurement using a laser Doppler vibrometer (JT).

Lab work

Quarter 1

Lab 1: Measurement of sound outdoors (GZ)

Lab 2: Measurement of sound power (CA)

Lab 3: Measurement of airborne and impact sound insulation (AA)

Quarter 2

Lab 4: Signal processing (JA)

Lab 5/6: Basic vibration measurements & Vibration measurement using a laser Doppler vibrometer (JT)

Teachers

WK Wolfgang Kropp <wolfgang.kropp[at]chalmers.se>

JA Jens Ahrens <jens.ahrens[at]chalmers.se>

JF Jens Forssén <jens.forssen[at]chalmers.se>

GZ Georgios Zachos <georgios.zachos[at]chalmers.se>

CA Carl Andersson <carl.andersson[at]chalmers.se>

AA Arthur Aglat <aglat[at]student.chalmers.se>

JT Jannik Theyssen <jannik@student.chalmers.se>

The course aim, as found at student.portal.chalmers.se, is as follows.

Aim

To work as an expert in noise control engineering requires the capability to design and carry out experimental work in a proper way. The course aims at giving the student insight in and understanding of acoustical measurement methods and the concepts associated with the methods. This also concerns the basics of practical signal processing.

Learning outcomes *(after completion of the course the student should be able to)*

Work experimentally in the field of sound and vibration including:

- The calibration of equipment both for air-borne and structure-borne sound measurements
- Applying standardized experimental methods, such as the determination of sound power, sound insulation, etc.
- Design of experiments fulfilling to standardization
- The application of signal processing techniques, such as FFT, correlation, etc.
- Carrying out measurement of subjective human response to sound and vibration.

Work successfully with a partner on the experimental task as team.

Develop a critical attitude to experimental approach which allow for correctly interpreting results; to critically treat, relate, and evaluate the methodology and the results.

Summarise and communicate the results in an appropriate way by reports.