UNIVERSITÀ DEGLI STUDI DI BRESCIA

Flow Duct Silencer Design – T-matrix method

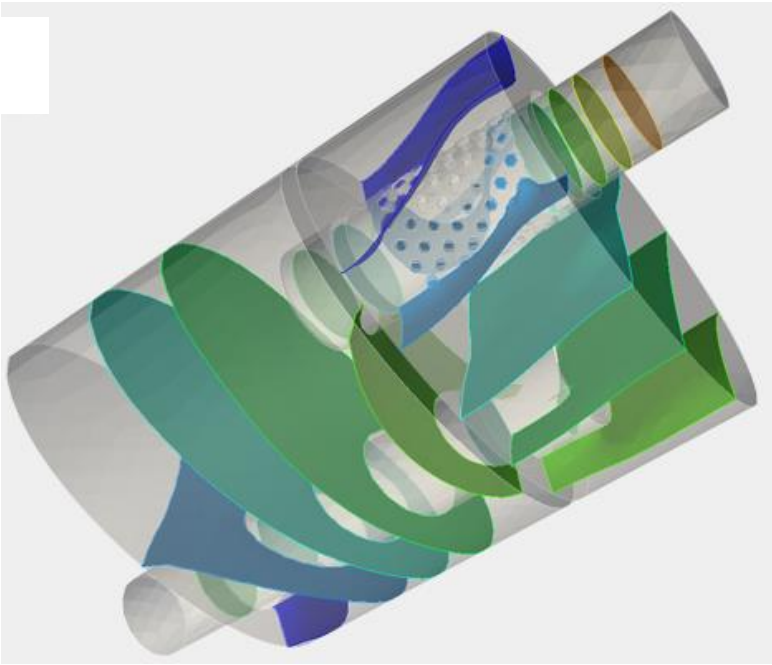
Prof. Ulf Carlsson

Marcus Wallenberg Laboratory
KTH
Stockholm

The course will be given face-to-face (ROOM N6) and broadcasted on-line (Microsoft TEAMS)

Noise from various kinds of flow duct systems gives an important contribution to noise pollution and annoyance. Ventilation systems, cooling systems, air conditioners and combustion engine exhaust systems are some examples. In this course you will learn the theory on how to use the T-matrix, or 4-pole, method to model the duct system and you will design and build a silencer able to reduce the noise to acceptable levels without adding a negative impact on the pressure drop.
The main advantage with the T-matrix method is that it provides a straight-forward method to analyse the acoustic properties of silencers built-up from various combinations of basic silencer components. Also the T-matrix can be combined with the acoustic properties of the source and receiver systems (the source and the "receiving room").

This course intends to provide you with a firm knowledge on how the T-matrix model can be used to analyse the acoustics of a duct system. Moreover, it will give you hands-on experience on how to design a silencer that satisfies acoustic requirements.



Finally, you will build and experimentally evaluate your silencer system.
Are you interested? … Sign-up for the course!

06-08-13-20 September 2021
University of Brescia, Via Branze 43

The seminars are sponsored by the *Funding for international cooperation,* free of charge to attend and open to everyone

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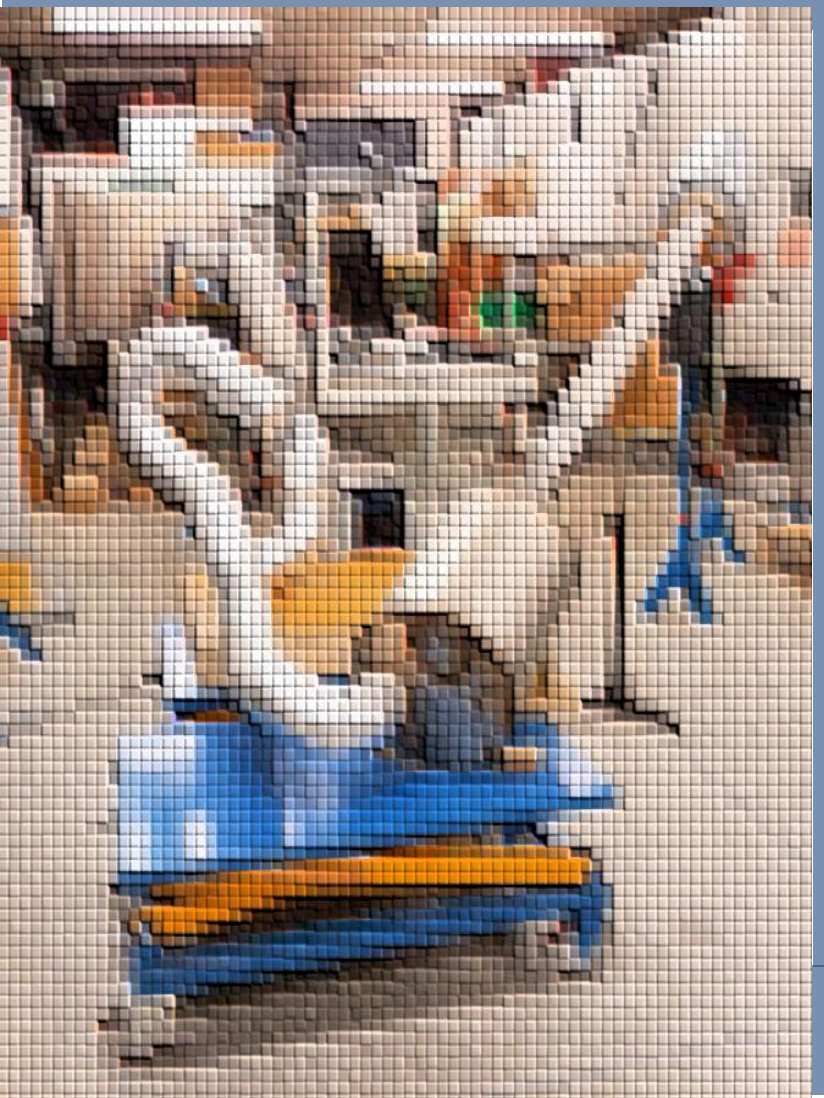


PRELIMINARY PROGRAM

- Lecture 1: 9.00 – 12.00, Monday 2021-09-06 (Room N6)
Sound propagation in ducts & Duct Acoustic Silencers
• Plane sound waves in ducts
• Acoustic power flow in ducts
• Acoustic impedance
• Flow duct acoustic systems

- Lecture 2: 13.00 – 16.00, Monday 2021-09-06 (Room N6)
Basic Silencer Components & T-matrix models
• T-matrix definition
• How to use T-matrix
• Basic silencer component's T-matrices
• Flow acoustics source model
• Receiver systems model
• Sound radiation to receiver system

- Computer Exercise 1: 10.00 – 12.00, Wednesday 2021-09-08 (Room N6)
Frequency analysis of duct sound & Silencer requirements

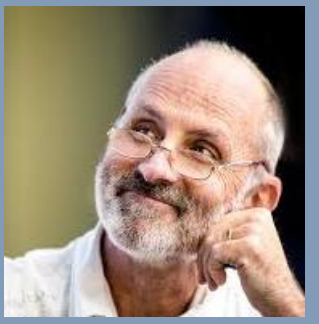
- Computer Exercise 2: 13.00 – 16.00, Wednesday 2021-09-08 (Room N6)
T-matrix and pressure drop models for silencer elements

- Computer Exercise 3: 9 – 12, Monday 2021-09-13 (Room N6)
Silencer Design with T-matrix model

- Laboratory Exercise: 10 – 12 or 13 – 15, Monday 2021-09-20 (Room to be assigned)
Silencer construction & Experimental validation
• Build your silencer
• Measure silencer insertion loss

The number of seats is limited. Please apply as soon as possible writing to:
edoardo.piana@unibs.it
stefano.uberti@unibs.it

Ulf Carlsson



- I live in Åkersberga 30 km north east of Stockholm and work at The Marcus Wallenberg Laboratory for Sound and Vibration Research KTH in Stockholm
- Employed since 1983 by The Marcus Wallenberg Laboratory for Sound and Vibration Research (MWL), Dept of Engineering Mechanics KTH Stockholm.
- Director of studies, Dept of Vehicle Engineering,
- MWL Laboratory responsible
- "Teacher of the year, 2018" award from the Student's union of KTH

The course is intended for PhD students, design and test engineers.
A basic understanding of physics and mathematics is recommended.