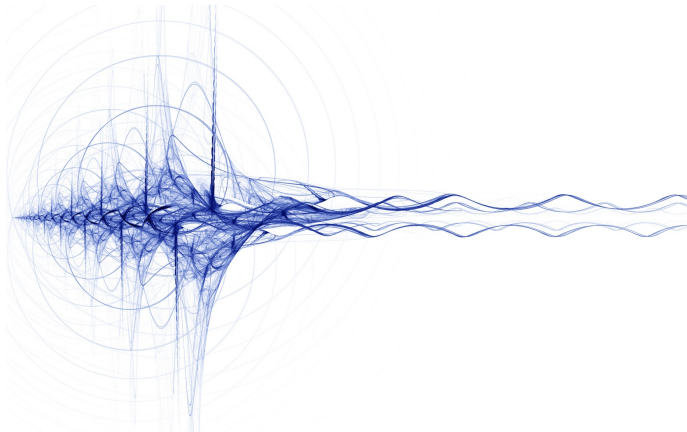


# Embedded Systems Hands-On 1: Design and Implementation of Hardware/Software Systems

## Task 5: Analog and Digital Filters



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## Questions so far



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- ▶ Any problems with group work?
- ▶ Any questions regarding Task 4?
- ▶ Two weeks appropriate for Task 4?

## Further Organization of the Lab



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- ▶ More time required for task block 1?
  - ▶ One month left
  - ▶ Two tasks to solve



## Further Organization of the Lab



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- ▶ More time required for task block 1?
  - ▶ One month left
  - ▶ Two tasks to solve
- ▶ Propose project topic for task block 2

## Further Organization of the Lab



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- ▶ More time required for task block 1?
  - ▶ One month left
  - ▶ Two tasks to solve
- ▶ Propose project topic for task block 2
- ▶ Short (optional) introduction to electrical engineering

## Task 5:

# Analog and Digital Filters



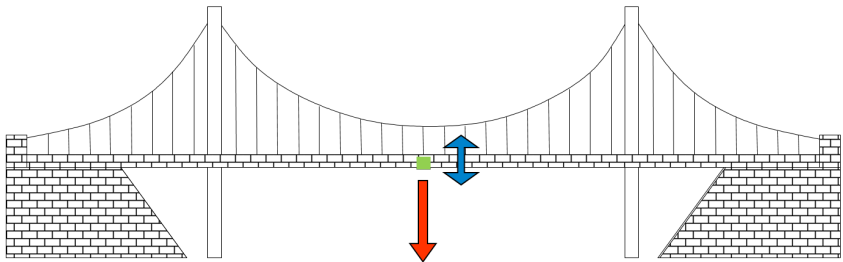
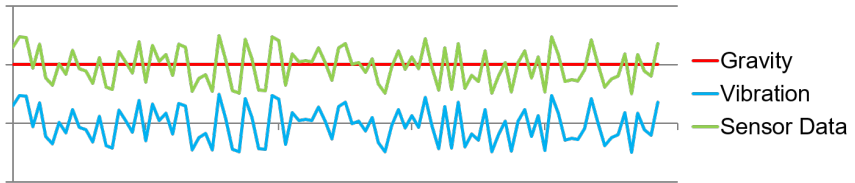
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- ▶ Simulation of analog filters with Qucs
- ▶ Observing the behavior of analog filters with waveform generator and oscilloscope
- ▶ Simulation and implementation of digital filters

# Frequency-dependent Disturbance



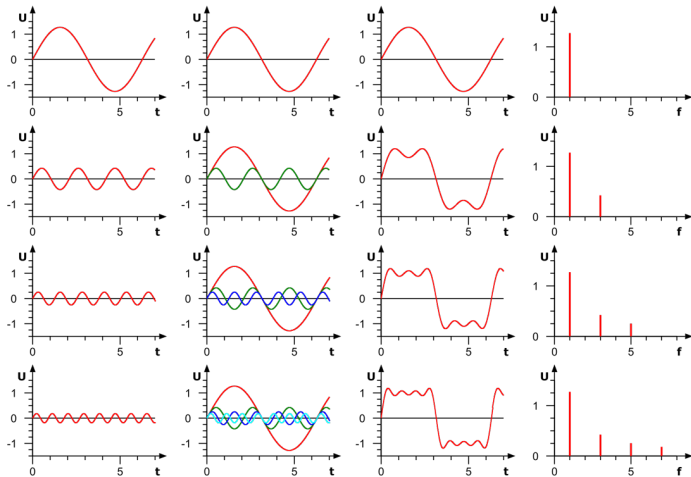
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# Higher-order Harmonics

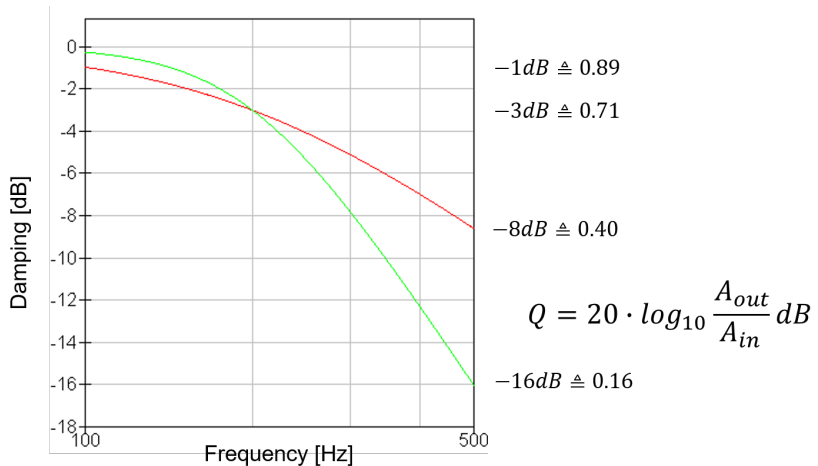


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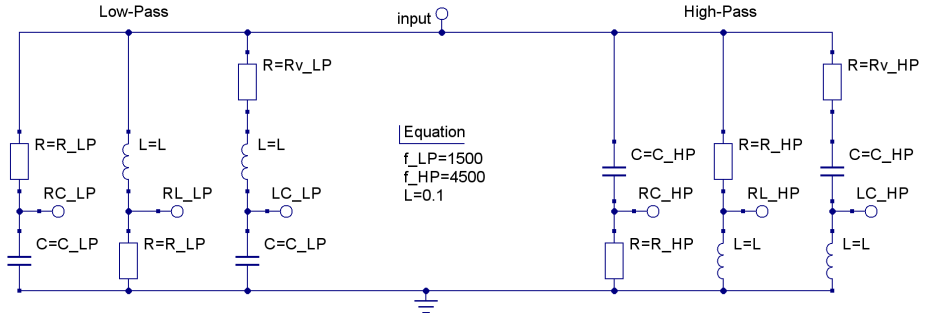
# Frequency Response of Low-Pass Filter



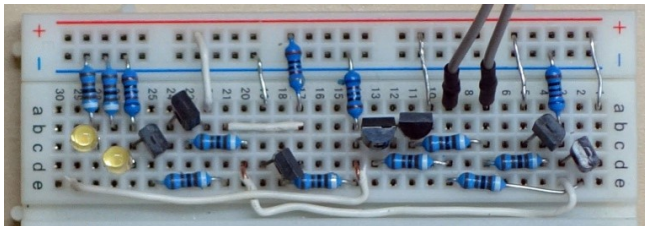
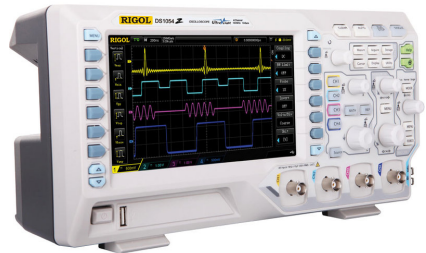
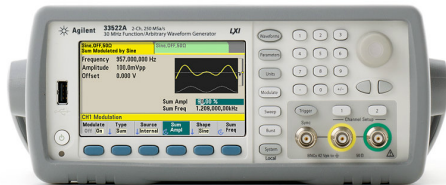
## Task 5.1: Simulation of Analog Filters



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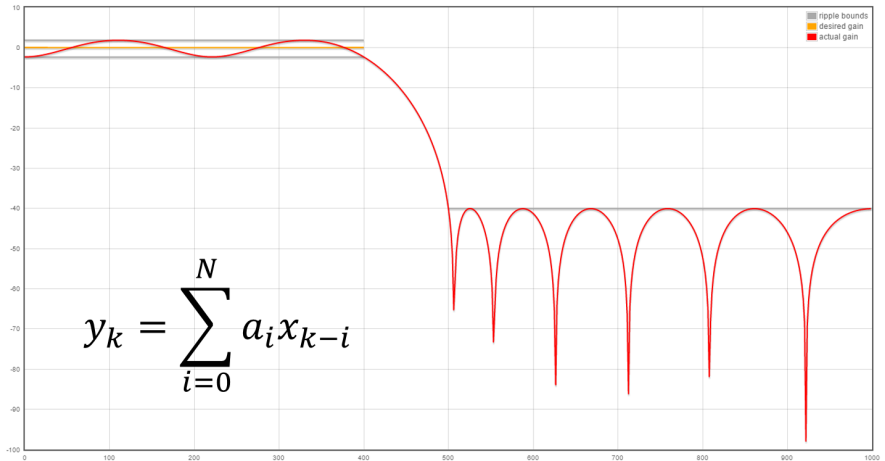
## Task 5.2: Measurement of Analog Filters



## Task 5.3: Simulation of Digital Filters



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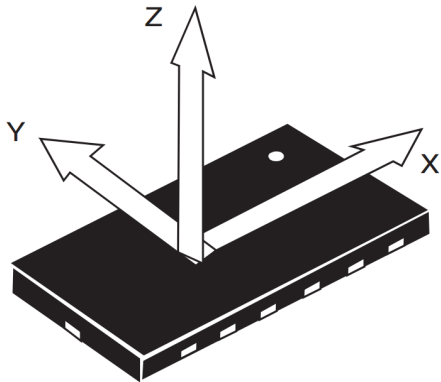


## Task 5.4: Realization of Digital Filters



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- Specify and implement suitable FIR filter for acceleration sensor



## Task 5.5: Choice of Filter Implementation



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- ▶ Advantages of analog / digital filters

# Embedded Systems Hands-On 1: Design and Implementation of Hardware/Software Systems

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