VIB : Vibration sources and Fourier Analysis

Number of participants: 27

1. I have watched the video on vibration sources before coming to the class

0 respondent

Yes	0%	0 votes
No	0%	0 votes
Partly (I fell asleep)	0%	0 votes

2. After watching the video I think that

11 correct answers
out of 22 respondents

✔	I understood most of the content	50%	11 votes
	I understood the general concepts but did not grasp the mathematics	50%	11 votes
	I did not understand the concepts nor the mathematics	0%	0 votes

3. The following are examples of free mechanical vibrations

8 correct answers
out of 24 respondents

✔	A bell ringing	67%	16 votes
	A worker using a jack hammer	29%	7 votes
✔	The bar of a football goal vibrating after being hit by a ball	71%	17 votes

	Vibrations due to a spinning washing machine	29%	7 votes

4. Which of the following statements are true ?

11 correct answers
out of 21 respondents

✔	A harmonic excitation is a special case of a periodic excitation	86%	18 votes
	A periodic excitation is a special case of a harmonic excitation	19%	4 votes
	The period of a random signal is much smaller than for an harmonic one	19%	4 votes
✔	A random force signal has an infinite period	57%	12 votes

5. A rigid rotating machine induces a force that is

5 correct answers
out of 25 respondents

✔	periodic	52%	13 votes
✔	harmonic	76%	19 votes
	random	8%	2 votes

6. Any rotating machine produces a

18 correct answers
out of 23 respondents

	harmonic force	22%	5 votes
✔	periodic force	78%	18 votes
	random force	0%	0 votes

7. When the rotational speed of a machine increases, the frequency of the forces produced

15 correct answers
out of 23 respondents

✔	Increases proportionally	65%	15 votes
	Decreases proportionally	0%	0 votes
	Increases with the square of the rotational speed	26%	6 votes
	Decreases with the square root of the rotational speed	9%	2 votes

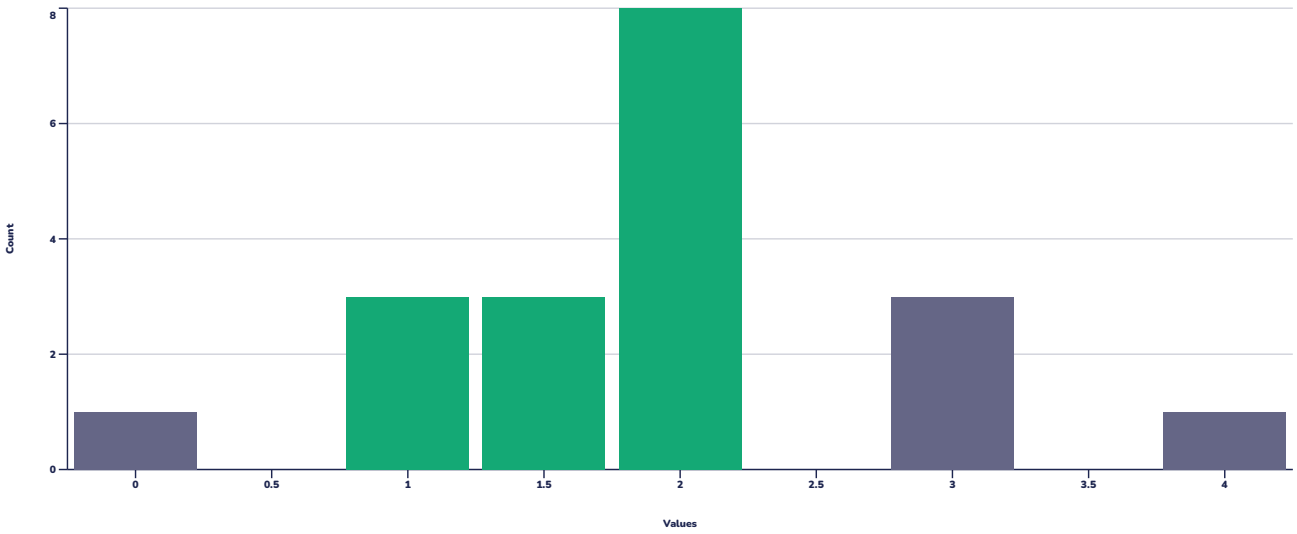
8. The force applied by a pedestrian walking or running at constant speed on a bridge is

20 correct answers
out of 25 respondents

	harmonic	20%	5 votes
✔	periodic	80%	20 votes
	random	0%	0 votes

9. The main frequency of excitation for walking pedestrians is around

17 correct answers
out of 19 respondents



0.33	1.96	4	2	0.82	0.67
Minimum	Mean	Maximum	Median	Standard deviation	Variance

Correct answer

Between 1 and 3

10. The discrete Fourier transform applies to

13 correct answers
out of 20 respondents

	any type of signal	35%	7 votes
	only random signals	0%	0 votes
✔	only periodic signals	65%	13 votes

11. The discrete Fourier transform computes amplitudes of sine and cosine functions at frequencies which are

0 correct answer
out of 19 respondents

✔	multiples of the fundamental angular frequency = 2pi/T	79%	15 votes
	odd multiples of the fundamental frequency = 2pi/T	16%	3 votes
✔	multiples of the fundamental frequency = 1/T	11%	2 votes

12. It is interesting to transform an excitation signal from

17 correct answers

12. ... the time domain to the frequency domain because

out of 21 respondents

✔	It provides information about the main frequencies of excitation which could cause structural resonance	81%	17 votes
	The signal is more compact in the frequency domain	0%	0 votes
	It is easier to add signals in the frequency domain	19%	4 votes

13. The continuous Fourier transform applies to

12 correct answers
out of 18 respondents

✔	any type of signal	67%	12 votes
	periodic signals only	22%	4 votes
	harmonic signals only	6%	1 vote
	it depends on the type of excitation of the system	6%	1 vote

14. The continuous Fourier transform of a rectangle (pulse) is

10 correct answers
out of 16 respondents

	a cosine function	19%	3 votes
	a sine function	19%	3 votes
✔	a sinc function	63%	10 votes
	a complex function which cannot be computed analytically	0%	0 votes

15. For a SDOF system (and MDOF), the Fourier transform of the impulse response h(t)

2 correct answers
out of 19 respondents

✔	allows to extract the information about the natural frequency	32%	6 votes
	cannot be computed analytically	0%	0 votes
✔	is the transfer function X(w)/F(w)	79%	15 votes

16. Convolution in the time domain corresponds to

19 correct answers out of 22 respondents

✔	multiplication in the frequency domain	86%	19 votes
	convolution in the frequency domain	9%	2 votes
	deconvolution in the frequency domain	5%	1 vote
	division in the frequency domain	0%	0 votes

17. The continuous Fourier transform of a sampled signal is

7 correct answers out of 20 respondents

	Discrete and periodic	50%	10 votes
✔	Continuous and periodic	35%	7 votes
	Discrete with the same number of samples as the original signal	15%	3 votes

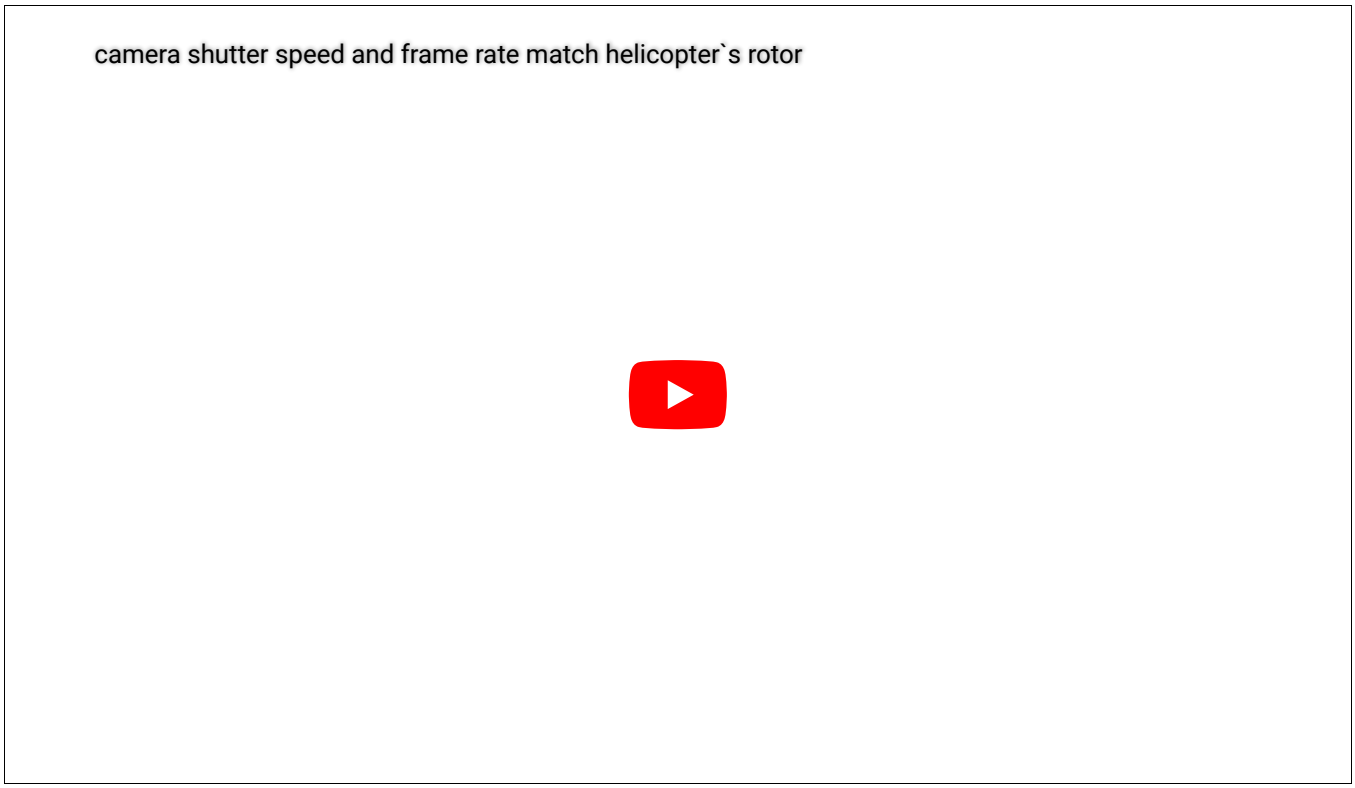
18. Aliasing happens when

12 correct answers out of 20 respondents

	The sampling frequency is too high with respect to the frequency content of the signal	30%	6 votes
✔	The sampling frequency is too low with respect to the frequency content of the signal	60%	12 votes
	The sampling frequency is equal to the frequency content of the signal	10%	2 votes

19. YouTube (camera shutter speed and frame rate match helicopter`s rotor)

0 respondent



20. When using Fast Fourier Transform on sampled signals, you can increase the frequency resolution by

0 correct answer
out of 15 respondents

	decreasing the time step of the sampling signal, keeping the total measurement time constant	60%	9 votes
	increasing the time step of the sampling signal, keeping the total measurement time constant	40%	6 votes
✔	increasing the measurement time, whatever the time step of the sampling signal	0%	0 votes

21. When using DFT, the time step of the sample signal has an influence on

7 correct answers
out of 18 respondents

	The frequency resolution of the DFT	33%	6 votes

✔	The maximum frequency of the DFT	39%	7 votes
	It has no influence on the DFT	28%	5 votes

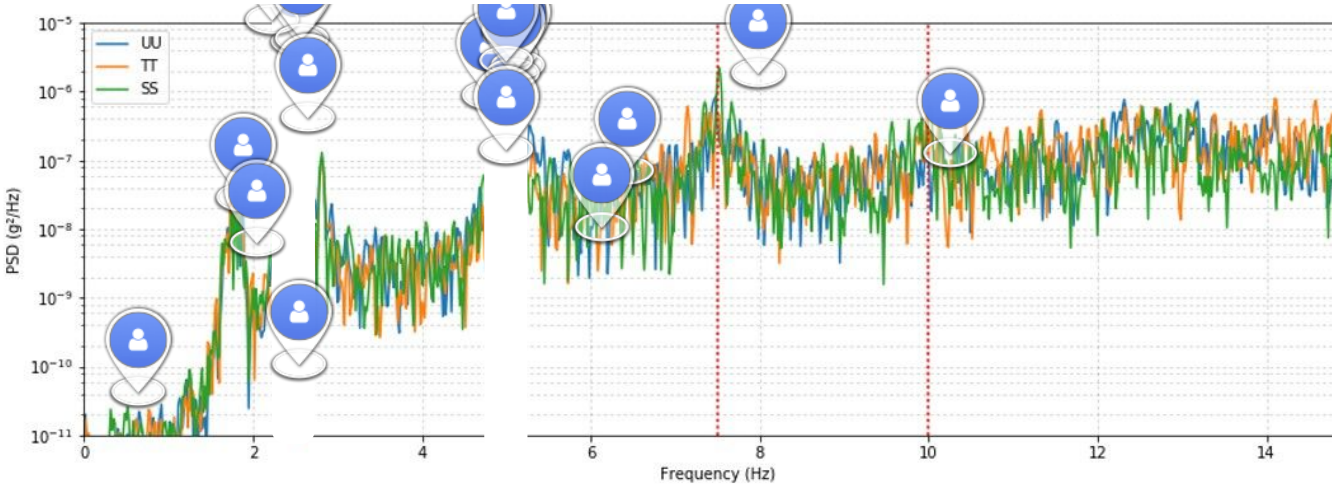
22. Suppose the sampling frequency of the accelerometer on your smartphone is 200 Hz. Up to what frequency can you measure acceleration signals ?

18 correct answers out of 19 respondents

	200 Hz	5%	1 vote
✔	100 Hz	95%	18 votes
	It depends on the length of the measurement	0%	0 votes

23. Following acceleration measurements show a real world structure responding to a particular vibration. Can you identify the frequency at which the highest loads are coming from?

20 respondents



24. Where do you think these frequencies are coming from?

5 respondents

Turbulence flow

Unbalanced loads

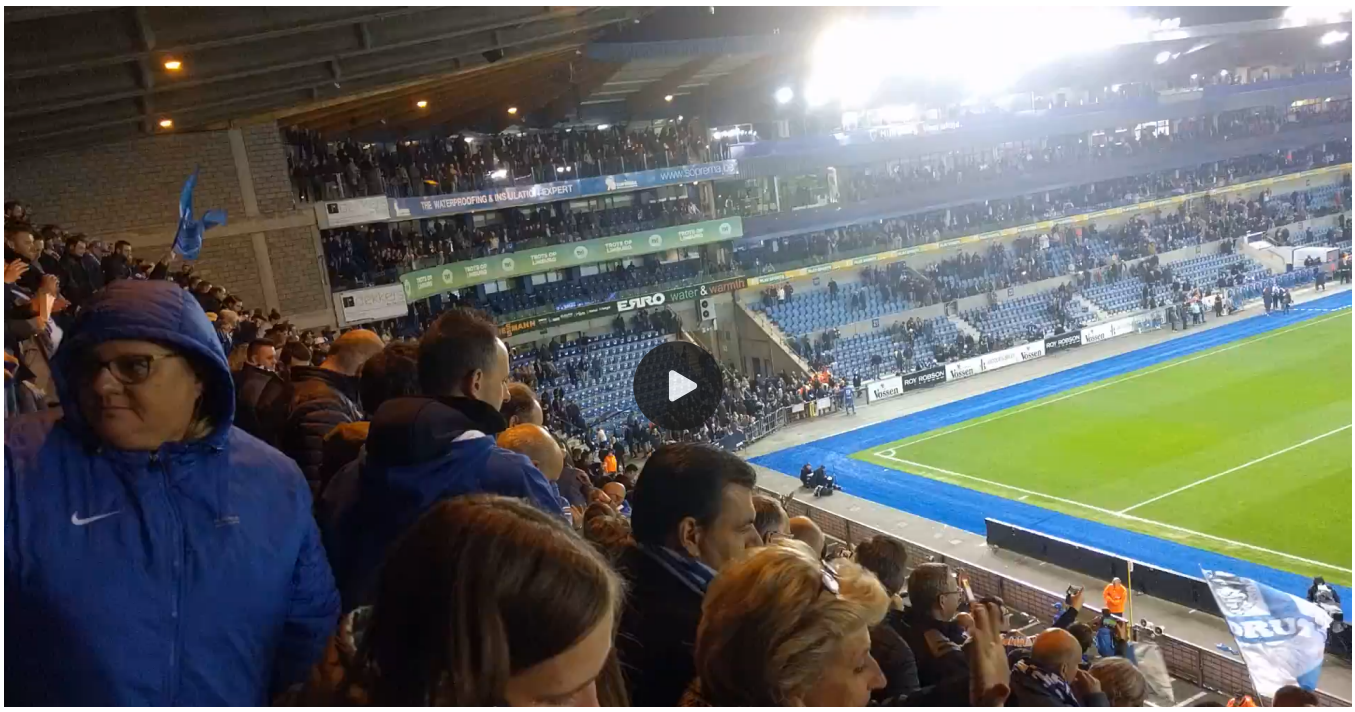
Résonance

Vibration from outside

Walking

25. VID_20190503_223348.mp4

0 respondent



0:00 / 0:32

We see people dancing and jumping to music.

This time-frequency plot, or waterfall plot, shows how

26. **This time-frequency plot, or waterfall plot, shows how the Fourier spectrum of an excitation source can vary over time. Do you have an idea which machine this is from?**

0 respondent

No answers in this question