Objectives Oscillations

Topic	Objectives
Oscillation	characterise an oscillation in words know two examples for mechanical oscillations (10.2, 10.4)
Simple harmonic motion	know the laws of motion for a simple harmonic motion (including the relations between the peak values) (10.2) graph displacement, speed and acceleration vs. time read amplitude, displacement, etc. from a diagram and calculate angular frequency, frequency, etc. derive the characteristic equation for a simple mechanical system from fundamental principles and find a formal expression for the oscillation period simple calculations with the period of a mass on a spring use the analogy between mass on a spring and LCO
Oscillation energy	simple calculations with conservation of energy for a simple harmonic motion (10.3) graph kinetic and elastic energy during a harmonic motion know different damping effects (10.5) explain the difference between under- and overcritical damping and know examples of both describe (both mathematically and graphically) a damped oscillation with the help of an envelope
Feedback and driven oscillation	explain the similarities and differences between feedback circuit and driven oscillation know a practical example of a feedback circuit sketch the resonance curves for different damping strengths know both positive and negative examples of resonance (10.6)
Superposition	represent the superposition of two oscillations with the same frequency in a phasor diagram calculate average and beat frequency for the superposition of two oscillations with similar frequencies (17.4)
Coupled oscillators	Find the natural oscillations of simple, symmetrical systems of coupled oscillators describe a general oscillation as the superposition of natural oscillations (Fourier) know examples of coupled oscillators

Constant	**Value**
period of a mass on a spring	$T = 2\pi\sqrt{m/k}$
period of a mathematical pendulum	$T \approx 2\pi\sqrt{L/g}$ (small amplitudes)
period of an LCO	$T = 2\pi\sqrt{LC}$
„scouts' clock" (period of a mathematical pendulum 1 m long)	T = 2 s