

Oscillations, Waves, and Optics 2021 - Course outline

v1 20210927

| day | lecture | | examples |
|---------|---|---|-----------------------|
| | Oscillations | concepts | |
| w 13/10 | 1 <i>Simple Harmonic Oscillator</i> | SHO (rev), complex notation (rev) | 1,2,3 |
| w 20/10 | 2 <i>Driven Harmonic Oscillator</i> | response functions (rev) power in oscillators transient response impedance | 4,5,6,7 |
| w 27/10 | 3 <i>Atoms and anharmonic motion</i> | atomic oscillators anharmonic oscillations* (non-examinable) driven anharmonic oscillators* coherence | |
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| | Waves | | |
| w 3/11 | 4 <i>Waves, wave equation</i> | transverse string waves (rev) 1D wave equation (rev) harmonic waves waves in 2D, 3D | 8,10 |
| f 5/11 | 5 <i>Polarization and Reflection</i> | elliptical polarisation power in waves wave impedance and reflection impedance matching | 11,15,16 |
| m 8/11 | 6 <i>Longitudinal waves</i> | longitudinal waves wave equation for sound impedance and power of sound waves | 9,13,14 |
| w 10/11 | 7 <i>Sounds in Solids, Standing waves, Damped waves</i> | longitudinal waves in solids standing waves in 1D, 2D, and 3D damped waves | 12 |
| f 12/11 | 8 <i>Group velocity, Dispersion</i> | wave dispersion phase velocity group velocity | 17,18,19 |
| m 15/11 | 9 <i>Dispersion of water waves, Waveguides</i> | water waves, waveguides waveguide dispersion evanescent waves | 20,21 |
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| | Optics | | |
| w 17/11 | 10 <i>Fourier Transformations</i> | Fourier series, transformations (rev) application to harmonic oscillator convolution theorem gaussian wave packets | |
| f 19/11 | 11 <i>Electromagnetic waves, diffraction Theory</i> | EM waves, wave equation reflection Fresnel-Kirchhoff diffraction integral Fraunhofer integral | 22 |
| m 22/11 | 12 <i>Fraunhofer diffraction</i> | Fraunhofer diffraction of 1D and 2D apertures linewidth and gratings | 23,24,25,26, 27,28,29 |
| w 24/11 | 13 <i>Fresnel diffraction, Cornu spiral</i> | imaging resolution Badinet principle Fresnel diffraction Cornu spiral | 30,31,32 |
| f 26/11 | 14 <i>Fresnel diffraction: Circular apertures</i> | Fresnel diffraction: circular apertures zone plates, Poisson's spot | 33,34,35 |
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| m 29/11 | 15 <i>Interferometry</i> | interference conditions Michelson's interferometer Fourier transform spectroscopy | 36 |
| w 1/12 | 16 <i>Thin-film interference</i> | thin-film interference Fabry Perot etalons | |