Syllabus

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Oscillations
simple harmonic oscillator
complex representation of oscillations
damping (emphasizing underdamped case)
driven oscillations and resonance, quality factor

Mechanical Waves
nondispersive wave eq. from wave kinematics (traveling waves)
harmonic traveling waves, complex representation
wave eq. for transverse waves on string
wave eq. for sound (1D)
Doppler effect

Superposition
standing waves
d'Alembert's general solution of the wave eq.
boundary conditions
reflection & transmission at fixed, free, change in medium; impedance
Fourier series
beats
group velocity, dispersion relations

Energy in mechanical waves
energy densities & flow rates
continuity equation
intensity, spherical waves

EM waves
Maxwell's eq in differential forms
wave eq for EM waves in vacuum
properties of EM plane waves
polarization
energy densities, Poynting vector, intensity
EM waves in dielectrics, index of refraction

Interference & Diffraction
two slit experiment
Michelson interferometer
multiple slits, gratings, resolving power
finite slit width
circular aperture, resolution
thin films

Quantum physics
photoelectric effect, the photon
Compton scattering
connection between classical EM wave and photons
de Broglie relation, interference & diffraction with electrons
time-dependent Schrodinger eq. (aka "quantum wave equation")
stationary states, time-independent Schrodinger eq.
particle in a box
probability density
finite well
H atom energy levels, line spectra
uncertainty principle
tunneling

Math Skills

In addition to the math skills you've used in Physics 1112 and 2213, we will use:

complex numbers (in particular, the complex representation of sinusoidal functions; Euler's identity; modulus of a complex number; polar form; real and imagninary parts)
partial derivatives (understanding what a partial derivative is)
differential equations (but we won't use any fancy techniques)
vector calculus (vector differential operator 'del'; gradient, divergence, curl, Laplacian)

OK