

Topic Specific Goals:

Maxwell Equations (lectures 2-9)¹

After taking this course, students will be able to:

- describe the differences between “real” E&M fields and complex amplitude fields and the representation of both in Maxwell’s equations.
- understand the derivation of the wave equation for light propagation in both vacuum and simple dielectric media.
- calculate the intensity of an E&M wave.
- explain the concept of spatial frequency of a wave and the restrictions it must satisfy to be an E&M wave.
- visualize and physically understand two exact solutions to the wave equation: plane and spherical waves.
- understand the paraxial approximation in terms of physics and when this approximation fails.
- derive the Fresnel approximation to the spherical wave (known as a paraboloidal wave).
- understand the derivation of paraxial wave equation of light propagation.

¹ Note that as PHYS301 or its equivalent is a prerequisite for this course, the first 4 points are considered review and thus will be covered as such.