Application of Fourier Analysis in Solving Linear Partial Differential Equations with Specific Boundary Conditions and Symmetries

Shamayita Ray

Abstract:

The theory of representing functions, associated with a linear partial differential equation with boundary conditions, by a Fourier series or a Fourier integral enables us to use the method of separation of variables and superposition to solve these problems. In this talk, I will discuss some properties of Fourier series and of the functions that can be expressed by a Fourier series or a Fourier integral. Then there will be a brief discussion on the different types of linear partial differential equations and then the Fourier series method of solving boundary value problems in linear partial differential equations. The method will be discussed with examples of these different types of equations with different symmetries (Cartesian, spherical or cylindrical symmetries) under specific boundary conditions. I will show how the solutions changes when the boundaries are at infinity.

References

[1] G.B.Arfken and H.J.Weber, *Mathematical Methods for Physicists*, 5th edition, Academic Press (2001).

[2] R.V.Churchill, *Fourier Series and Boundary Value Problems*, McGraw-Hill Book Company(1941).

[3] G.B.Folland, *Fourier Analysis and Its Applications*, Brooks/Coles Publishing Company (1992).