

IIT Faculty: Gopal Srinivasan, IIT Bombay

Department: Mathematics

Topic Name: Fourier Series

Relevant Course: Mathematical Methods

Relevant Department: Mathematics

Relevant Semester: Fourth Semester

Pre- requisite: Calculus and Linear Algebra

Course Description and Outline:

Fourier Analysis is an important component in Engineering Education and is pervasive throughout science and engineering. In this course we shall discuss the rudiments of Fourier Analysis focusing primarily on Fourier series.

List of Topics to be covered

Session 1:

- 1) Periodic Functions and the formal Fourier series
- 2) Issues of Convergence: The Dirichlet Kernel and the Riemann Lebesgue lemma
- 3) Failure of pointwise convergence and sufficient conditions for pointwise convergence - Dirichlet's theorem.

Session 2:

- 4) Examples of Fourier series of Triangular waves, Square waves and sawtooth waves.
- 5) Mean Convergence (RMS) value
- 6) Bessel's inequality and Parseval Formula

Session 3:

- 7) Application of Parseval formula to solve a geometrical problem (the isoperimetric problem)
- 8) Least square approximations
- 9) Applications to PDEs.