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MATH 717
SPRING 2018

FUNCTIONAL ANALYSIS

Tuesday, Thursday, 9:30-10:45

This second course in real analysis involves the basics of normed and other function spaces. Functional analysis techniques are involved in almost all modern applications of analysis, and are important to researchers in engineering, probability and statistics, mathematical finance, theoretical physics, dynamical systems, economics, machine learning and neural nets, partial differential equations, and many areas of applied mathematics. Many current papers in mainstream engineering, physics, and neural network journals have applications of functional analysis as their central themes, and it (along with geometry) is also actively used in current developments in theoretical physics.

This course is an introduction - we will survey the fundamentals, together with a number of standard applications.

Topics covered will include topological vector spaces, Hilbert and Banach spaces and their geometry, ergodic theory, locally convex spaces, fixed point theorems, separation theorems, bounded operators, and spectral theory.

Extended applications will include wavelet theory, neural network theory and machine learning, topics which have generated interest in mathematics and various areas of science and engineering. Topics in wavelet theory will include a general introduction, discrete and continuous wavelet expansions, construction of wavelets, and applications. Neural network topics will include mathematics of feedforward neural networks and theorems on their approximation properties, as well as radial basis function networks. These topics will extend to machine learning, in which kernel methods will be emphasized. Other applications of these topics will be discussed.

Some work with analysis is a pre- or co-requisite.

For further information, contact

M. Kon, Math and Statistics Department
Email: mkon@bu.edu
Phone: 353-9549