Advanced Research Initiative

MARSHALL | MATHEMATICS & PHYSICS

Speaker: Dr. Martin Bohner
Date: 23 January 2025 at 1:00PM
Location: SH 621
Online link: https://bit.ly/40hDQ0o
Title: Time scales

Abstract:

Time scales have been introduced in order to unify continuous and discrete analysis and in order to extend those theories to cases "in between". We will offer a brief introduction into the calculus involved, including the so-called delta derivative of a function on a time scale. This delta derivative is equal to the usual derivative if the time scale is the set of all real numbers, and it is equal to the usual forward difference operator if the time scale is the set of all integers. However, in general, a time scale may be any closed subset of the reals.
We present some basic facts concerning dynamic equations on time scales (those are differential and difference equations, resp., in the above two mentioned cases) and initial value problems involving them. We introduce the exponential function on a general time scale and use it to solve initial value problems involving first-order linear dynamic equation. We also present a unification of the Laplace and Z-transform, which serves to solve any higher-order linear dynamic equations with constant coefficients.
Throughout, we discuss some recent developments and applications of time scales theory to biology, economics, and finance.

References

[1] M. Bohner and A. Peterson. *Dynamic Equations on Time Scales: An Introduction with Applications*. Birkhäuser, Boston, 2001.

[2] M. Bohner and A. Peterson. *Advances in Dynamic Equations on Time Scales*. Birkhäuser, Boston, 2003.

[3] M. Bohner and S. Georgiev. *Multivariable Dynamic Calculus on Time Scales*. Springer, 2016.

DYNAMIC EQUATIONS