

Coherent pairs of linear functionals and Sobolev Orthogonal Polynomials.

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Abstract

The study of polynomials orthogonal with respect to a Sobolev inner product has attracted the attention of many researchers during the last years (see [3] for a survey on this topic). Their constructive approach in the univariate and multivariate cases, respectively, as well as their properties in the framework of approximation theory (Fourier series) and numerical analysis (spectral methods for Boundary Value problems for ODEs and PDEs) have been deeply analyzed.

In this talk we will focus the attention on the Sobolev orthogonal polynomials associated with the so-called coherent pairs of measures ([2]) and the coherent pairs of the second kind (see [1]), respectively. The characterization of such pairs of measures will be discussed. In the second case, when one of the measures is classical (Jacobi and Laguerre) we will analyze the corresponding sequences of Sobolev orthogonal polynomials. We will deduce analytic properties of them.

Coherent pairs and coherent pairs of the second kind of Borel measures supported on the unit circle will be also presented (see [4]). Some open problems will be discussed.

References

- [1] H. Hancco Suni, G. A. Marcato, F. Marcellán and A. Sri Ranga, *Coherent pairs of measures of second kind and associated Sobolev orthogonal polynomials. A functional approach*. 2022. Submitted.
- [2] A. Iserles, P. E. Koch, S. P. Nørsett and J. M. Sanz-Serna, *On polynomials orthogonal with respect to certain Sobolev inner products*. J. Approx. Theory **65** (1991), no. 2, 151–175.
- [3] F. Marcellán and Yuan Xu, *On Sobolev Orthogonal Polynomials*. Expo. Math. **33** (2015), 308-352.
- [4] F. Marcellán and A. Sri Ranga, *Sobolev orthogonal polynomials on the unit circle and coherent pairs of measures of the second kind*. Results in Math. **71** (2017) 3-4, 1127 -1149.