

Orthogonal Polynomials with respect to Sobolev inner products. An analytic approach with Applications.

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SUMMARY

In this talk we will analyze sequences of orthogonal polynomials with respect to an Sobolev inner product associated with a vector of positive Borel measures supported on the real line. First of all, a historical sketch of motivations for their study will be pointed out. In particular, we will focus the attention on the so-called coherent pairs of measures ([1]). Second, we will emphasize some results concerning constructive methods of Sobolev orthogonal polynomials, Their connection with matrix analysis and operator theory as well as the convergence of Fourier series in terms of coherent pairs will be discussed for different cases of Sobolev inner products. Finally, some applications to the study of Boundary Value Problems for ODEs in the framework of spectral methods will be given (see [3]). For an overview on orthogonal polynomials in Sobolev spaces you can read [2].

Keywords: Orthogonal polynomials, Sobolev inner products, coherent pairs of measures, Fourier series, boundary value problems, spectral methods

AMS Classification: 33C45, 33C47, 42C05

References

- [1] 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, 151175.
- [2] F. Marcellán and Yuan Xu, *On Sobolev Orthogonal Polynomials*. Expo. Math. **33** (2015), 308-352.
- [3] Xuhong Yu, Zhongqing Wang and Huiyuan Li, *Jacobi-Sobolev Orthogonal Polynomials and Spectral Methods for Elliptic Boundary Value Problems*, Commun. Appl. Math Comput. **1** (2019), 283–308.

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