Innovative Content Line of Orthogonal Expansions in Mathematics

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Abstract: It is argued that the content line of orthogonal decompositions is innovative, because it introduces students to the range of urgent problems of mathematical science and is characterized by the applied nature of the problems solved in the process of mastering the corresponding material. Development levels are highlighted, the content issues are proposed. The process of step-by-step exposition is built: geometric vectors, bases on the plane and in space, finite-dimensional and infinite-dimensional spaces, scalar product and orthogonality, Fourier series, trigonometric expansions, applications to solving equations of mathematical physics. It is noted that the study of exponential average Fourier series used in heat and mass transfer problems is a topic of modern scientific research. It is proposed to use a number of new concepts and methods (for the traditional course of mathematics) in the educational process: classes of functions integrable with a square, the orthogonalization method, the Cauchy–Bunyakovsky inequality, etc.