Garments frequently subject to deformations during wear creating undesirable wrinkles on fabric surface; therefore, crease or wrinkle recovery is one of the fundamental properties of fabrics affecting product performance. Besides, for some end use necessities such as pleating of a garment part, crease retention is required. Here, a nanocomposite finishing treatment was produced consisting of temperature sensitive shape memory polyurethane (SMPU) and cellulose nanowhisker (CNW) as nanofiller to create dual responsive structure. Produced nanocomposite was applied on wool fabric for dynamic crease recovery and retention functions under dry and wet environments above $T_g$ of SMPU. Smart crease recovery and retention behaviors of the treated fabrics were tested by a comprehensive test procedure including air and water at different temperatures simulating laundry and drying processes. Surface morphologies and chemical structure of the treated wool fabric samples were characterized by SEM and FT-IR analyses. Moreover, weight, bending rigidity and tear strength of treated fabrics were tested to examine the effect of nanocomposite treatment on the mechanical and hand properties of the fabric. Results showed that treated fabrics can recover to their original flat appearance (max. 88.0%) and designed creased states (max. 76.69%) within hot water environment with the help of nanocomposite treatment having both temperature and water responsiveness. It is believed that SMPU-CNW nanocomposite finishing treatment is an effective application for producing smart garments that return to their original form dynamically during washing and laundry cycles without the need of ironing.