Thermo-responsive shape memory polymers (SMPs) are commonly used smart materials and shape memory polyurethanes (SMPUs) are one of the most popular examples. In this manner, formation of nanocomposite materials by introducing hydrophilic nanoparticles as switching element into polymer matrix is a very useful approach to obtain the water-responsive SMPs. Among these nanoparticles, nano-Al2O3 have attracted much attention due to their availability, stability, hydrophilicity, large amounts of hydroxyl groups and suitable mechanical strength. In this study, an applicable method is introduced for fabricating dual responsive (thermal and water sensitive) shape memory composite nanofibers. Commercially available SMPU was filled with nano-aluminium oxide (nano-Al2O3) (5-20, wt. %) by simple solution mixing method and nanofibers were fabricated via electrospinning. The modification of SMPU by nano-Al2O3 is a simple method for obtaining dual responsive nanostructures without need for complex synthesis routes. Besides morphological (SEM), chemical (FT-IR) properties, shape memory performances of the composite nanofibrous webs were investigated by mechanical-thermo-aqueous programming tests. The results showed that nano-Al2O3 can be well dispersed within the SMPU matrix by a surfactant modification and SMPU nanofibrous webs had good surface morphology. The strong hydrogen bond interactions between SMPU chains and hydroxyl groups on nano-Al2O3 were identified by FT-IR. According to thermal-aqueous test results, the minimum values of 50% shape fixity belonged to neat SMPU, whereas the composite nanofibers containing 20% nano-Al2O3 had the maximum value of 95%. Furthermore, this sample had a shape recovery of 96% and 75.41% of this recovery belongs to water-induced shape memory effect. These results are promising and therefore suggest that modifications SMPU conducted by nano-Al2O3 could be applicable for obtaining an excellent thermally-induced and water-induced shape memory effect, simultaneously.