Nanofluids, as a kind of new engineering material consisting of nanometre-sized additives and base fluids, have gained extensive attention due to their role in improving the efficiency of thermal systems. This paper presents an experimental investigation on the heat transfer coefficient and friction factor of BioGlycol/water based TiO$_2$ nanofluids flowing in a flat tube under turbulent flow conditions. TiO$_2$ nanoparticles with average diameters of 50 nm dispersed in BioGlycol/water of 20:80% mixture ratio respectively with volume concentrations of 0.5–2 vol.% were used as the working fluid. Moreover, this investigation was carried out at operating temperatures of 30, 50 and 70 °C and under constant heat flux boundary conditions. The results showed that the Nusselt number of nanofluid is higher than that of the base liquid and increased with the increasing of the Reynolds number and operating temperatures. The Nusselt number of nanofluids was approximately 28.2% greater than that of base fluid and the results also showed that the Nusselt number of the nanofluids at a volume concentration of 2.0 vol.% was approximately 3% lower than that of base fluids for certain conditions. For the friction factor, the results show that the friction factor of nanofluids at 1.0 vol.% was approximately 6.1% higher than the base fluid and increases with the increase of volume concentrations to be 14.3% at 2.0 vol.% higher than the base fluid. Finally, the new correlations were proposed for predicting the Nusselt number and friction factor of the nanofluids with maximum deviation of 10% and 3% respectively.