Carbon dioxide (CO2) at supercritical phase is being used recently in Heating, Ventilation, Air Conditioning and Refrigeration (HVAC&R) industries due to its special thermal properties of supercritical CO2, which leads to better performance of heat transfer and flow characteristics. Therefore, the main purpose of this study is to develop flow and heat transfer CFD models and validate the models by comparing with previous studies from literature. For the simulation, the CO2 flow was assumed to be incompressible, turbulent, non-isothermal and Newtonian. The numerical results compared with the experimental data obtained from (Liao and Zhao 2002). The experimental data consisted of three different cases with different inlet pressure (P), inlet temperature (Tin) and tube diameter (d). All the maximum and minimum temperature percentage differences for all three cases are in a small values. Moreover, the surface area, $A$ of the tube is inversely proportional to heat transfer coefficient ($h$). Besides, the pressure drop ($\Delta P$) for all three cases increased together with $h$ when the tube diameters decreased. The numerical results were in good agreement with experimental results for temperature distributions. The CFD model is validated.