Human-robot interaction combines robotic precision with human adaptability, making safety and compliance essential for effective collaboration. This thesis develops a unified framework to address these requirements under uncertain dynamics, state constraints, unmeasured states, and unavailable interaction forces. A fixed-time adaptive impedance controller is proposed to ensure compliant behaviour with guaranteed parameter and impedance convergence. Safety is achieved through a switched-reference admittance control scheme for known dynamics and a robust tube-based model predictive control framework for uncertain systems. An unknown-input dynamic observer is also developed to reconstruct unmeasured states while treating interaction force as an unknown input. Overall, the thesis advances safe, compliant, and reliable human-robot interaction for applications in automation, rehabilitation, and healthcare.