In Tokamak department of Institute of Plasma Physics, radiation of high-temperature plasma is investigated using spectroscopic methods in visible, ultraviolet and infrared regions. The radiation gives information regarding tokamak plasma parameters and their changes, which is necessary for future realization of fusion reactor. In the frame of this doctoral thesis the development of spectroscopic diagnostics for observing of plasma radiation and its temporal evolution in COMPASS tokamak was performed. The absolute calibration of developed systems in order to recalculate measured signal to units of radiation was done. The sources of imprecisions of absolute measurements in tokamak conditions are properly discussed in the first part of the dissertation. Plasma radiation in the range 257-1083 nm was measured and interpreted using NIST database and FLYCHK code. Ion density for the most significant impurities was estimated. IDL code for effective ion charge estimation as a ratio of real and hydrogen plasma Bremsstrahlung radiation near 523 nm was developed. Profiles of electron density and temperature measured by Thomson scattering system were used for hydrogen plasma Bremsstrahlung radiation calculations. The example of applying of spectroscopic data for studying of COMPASS plasma heating using neutral beam injections is given in the last part of this work.