We present a spectral analysis of three simultaneous Nuclear Spectroscopy Telescope Array and Swift/XRT observations of the transient Be-neutron star binary KS 1947+300 taken during its outburst in 2013/2014. These broadband observations were supported by Swift/XRT monitoring snapshots every three days, which we use to study the evolution of the spectrum over the outburst. We find strong changes of the power-law photon index, which shows a weak trend of softening with increasing X-ray flux. The neutron star shows very strong pulsations with a period of $P \approx 18.8$ s. The 0.8-79 keV broadband spectrum can be described by a power law with an exponential cutoff and a blackbody component at low energies. During the second observation we detect a cyclotron resonant scattering feature at 12.5 keV, which is absent in the phase-averaged spectra of observations 1 and 3. Pulse phase-resolved spectroscopy reveals that the strength of the feature changes strongly with pulse phase and is most prominent during the broad minimum of the pulse profile. At the same phases the line also becomes visible in the first and third observation at the same energy. This discovery implies that KS 1947+300 has a magnetic field strength of $B \approx 1.1 \times 10^{12}(1 + z)$ G, which is at the lower end of known cyclotron line sources.