Neuronal oscillations are thought to play an important role in working memory (WM) and speech processing. Listening to speech in real-life situations is often cognitively demanding but it is unknown whether WM load influences how auditory cortical activity synchronizes to speech features. Here, we developed an auditory n-back paradigm to investigate cortical entrainment to speech envelope fluctuations under different degrees of WM load. We measured the electroencephalogram, pupil dilations and behavioural performance from 22 subjects listening to continuous speech with an embedded n-back task. The speech stimuli consisted of long spoken number sequences created to match natural speech in terms of sentence intonation, syllabic rate and phonetic content. To burden different WM functions during speech processing, listeners performed an n-back task on the speech sequences in different levels of background noise. Increasing WM load at higher n-back levels was associated with a decrease in posterior alpha power as well as increased pupil dilations. Frontal theta power increased at the start of the trial and increased additionally with higher n-back level. The observed alpha-theta power changes are consistent with visual n-back paradigms suggesting general oscillatory correlates of WM processing load. Speech entrainment was measured as a linear mapping between the envelope of the speech signal and low-frequency cortical activity.