Several experiments have reported the detection of high fluxes of TeV gamma-rays from Markarian 421 in early 2001. We describe preliminary results from observations of Markarian 421 during the period February to May 2001 using the Solar Tower Atmospheric Cherenkov Experiment (STACEE). STACEE is sensitive to gamma-rays in the energy range from about 50 to 500 GeV. Our results will be discussed in the context of multi-wavelength observations of Markarian 421 by other experiments during this outburst. The low energy threshold of STACEE should allow us to extend the gamma-ray spectrum of this source, thereby placing additional constraints on emission models during outburst.