This paper presents the use of the ArchC Architecture Description Language (ADL) as a support tool for computer architecture courses. ArchC enables students to perform several experiments using its automatically generated SystemC simulators, covering topics from simple single-cycle (functional) models to pipeline and memory hierarchy simulation. We show how instructive may be the process of modeling a processor using an ADL and suggest several possible exercises, following the course development structure presented in the classical Hennessy and Patterson's computer architecture didactical book. Moreover, we report how the experience of assigning students to study and to model modern embedded architectures has provided good results on an undergraduate computer architecture course at IC-UNICAMP. The simplicity and flexibility of the ADL, along with its simulation features, proved to be an useful tool not only for research, but also for computer architecture education.