

# Virtuoso Education Kit

## Getting Started Guidelines

### Introduction

With this lab education kit, you will learn to use the Virtuoso analog design environment from Cadence Design Systems.

At the end of the lab students will be able to:

- Enter a schematic, create a symbol view and a testbench
- Run basic simulations and an outlook beyond
- Create a simple layout
- Understand physical verification
- Perform reliability and EMIR analysis
- Understand parasitic extraction
- Understand the difference between pre-layout and post-layout simulation results

As prerequisite to the labs, students should have basic understanding of analog devices.

After completing the labs, the students should be able to design, simulate and layout their own simple analog circuits with Virtuoso analog design environment.

### Hardware and Software Requirements

This section describes the hardware and software requirements for the lab, including an overview and Cadence tool requirements.

#### Cadence University Program

The Cadence University Program provides educational institutions with easy access to the leading EDA tools from Cadence, the Cadence University Package contains all tools, which are necessary to run the labs in this Education Kit. In order to apply for the Cadence University Program, please write an email to [universityprogram@cadence.com](mailto:universityprogram@cadence.com).

#### Cadence Tools

The labs have been tested with:

- Virtuoso Custom IC Design Environment (IC 23.10.080)
- Spectre Circuit Simulators (SPECTRE 23.10.538)
- Physical Verification System (PVS 23.11.000-ISR1)
- Quantus Extraction Tools (QUANTUS 22.11.000)

## Process Design Kit

The following are the steps to download and install the Process Design Kit (PDK).

1. Download the **GPDK45** from the Cadence Online Support. In order to get access, you need to have an online account.
  - <https://support.cadence.com/>
2. Create a directory, here called “path/to/general/pdk/directory”, where you would like to place the pdk main folder.
3. To decompress the file that you have downloaded, you can use the terminal and the command  

```
tar -xzvf gpdk045_v_6_0.tar.gz -C /path/to/general/pdk/directory
```
4. Set the “GPDK\_045” environment variable to  
“/path/to/general/pdk/directory/gpdk045\_v\_6\_0”.
5. Set the “CDS\_Netlisting\_Mode” environment variable to “Analog”.
6. Set the “CDSHOME” environment variable to the Cadence DFII installation path.
7. After you launch Virtuoso, as with any other library, add the “gpdk045” library to your list of libraries as in “Module 1” of the education kit. The library location is at “\$GPDK\_045/gpdk045”.

Detailed information regarding the pdk hierarchy and more can be found in the “gpdk045\_pdk\_referenceManual.pdf” file under \$GPDK\_045/docs.

## Lab Files

The lab files in **amplifier\_common\_source.tar.gz** are available to instructors who adopt this course. This is provided as a reference. The students are expected to start from scratch.

For the instructors who would like to open this library, first, you need to place the compressed file in your working directory. Second, you need to decompress the file. Finally, you need to add the file (library) in the Library Manager using the Library Path Editor.

To decompress the file, you can use the terminal and the command

```
tar -xzvf amplifier_common_source.tar.gz -C /path/to/your/working/directory
```

Note that if you had previously created the library “amplifier\_common\_source” in your working directory and at a certain point you decided to decompress the file, the tool will overwrite the existing library. Add library in Virtuoso as described in “Module 1” of the education kit.

## Troubleshooting

Technical support for VLSI CAD tools is a perennial challenge. Preferably, the faculty member teaching the course will have industrial experience using and troubleshooting the Cadence tools and a staff system administrator will have or can develop experience with licensing, tool installation, and Linux support.

The Cadence University Program provides technical support related to software installation and licensing to one professor and to a system administrator, but not to students. However, students can ask their professor for a Cadence Online Support account (<https://support.cadence.com>) through which they can access Cadence Online Trainings, Rapid Adoption Kits and documentation of Cadence tools.