

ENEE 417 Experiments Weeks 1 & 2
Weeks starting 01/25/17 and 02/01/17

- a. Obtain access to the Laboratory room AVW 1334.
- b. File the form for and obtain a breadboard for course circuit constructions.

There should be six working computers with DAQ in Room 1334.

The main tasks for the first weeks are to learn device curve tracing, LabVIEW, automated data acquisition via the DAQ board, PSpice model determination, and VLSI layout via MAGIC with Spice extractions.

1. Learn to use the Tektronix 577-177-D1 curve tracer – as there is only one of these, parties of two will have to take turns. Set it up and run, using the Tektronix first time settings, on various devices, including npn (2N3904) and pnp (2N3906) BJT transistors and 4007 CMOS transistors. Record and calculate key parameters such as forward and reverse betas and currents at several I_B , Early voltage, K_P , V_{TO} , etc. for later comparisons.
2. Learn LabVIEW by working through the help examples, tutorials or manuals.
3. On any of the 417 Lab computers, first check the data acquisition card by going through the last five steps listed in the DAQ Quick Start Guide (copies are on the web and in the Lab).
4. Configure the DAQ input and output terminals using conventional DAQ in the NI Measurement and Automation configuration program, NI MAX.
5. Run Mr. E. L. Tan's curve tracing program in LabVIEW on a 2N3904 transistor; save the curves and compare with data obtained via the Tektronix curve tracer. Follow the directions in Mr. Tan's guide. Note that if more than one run occurs the program does not reset the base current so edit the LabVIEW program by placing an if statement in the for loop to reset to zero when the for statement starts over [for this you may need to change the statement in your own copy from $v_s = b_i + i_t * b_s$; there may also be an error in an inequality statement]
6. Run curves for several values of base current I_B and save the data on the oscilloscope's USB port or in the computer; again compare with the data from the LabVIEW and Tektronix curve tracers.
7. Perform similar experiments with CMOS N and P channel transistors using the 4007 package. Investigate the effect of substrate bias on the I_D curves. .

Be sure to have chosen an approved base paper by the end of the third period.

Some Other Information

To learn LabView

- a) Run the LabVIEW tutorials
- b) Go through Getting Started with LabVIEW
- c) Then Open VI, Examples, apps, freqresp.lib, Frequency Response vi, etc.

. After time on LabView switch to the data acquisition

Use the National Instruments (Measurement & Automations icon), and then expand (dbl click) Devices and Interfaces. Expand (single click) the PCI-MIO-16E-4 icon. Go to Test Panel on the upper menu bar. Then select Analog Output and channel 1. Put a multimeter on pins 21 (DAC1OUT; see p. 4-2 of PCI E Series User Manual for pin numbers) and 55 (AOGND). Change DC Voltage, Update Channel (lower left of Test Panel) and read the multimeter (which will indicate the voltage that is an output of the DAQ card).