

ENEE 417 Experiments Weeks 1 & 2  
Weeks starting 01/26/09 and 02/02/09

- a. If you do not already have permission, file the forms for using the ENEE 417 laboratory computers and obtain your user password. Also make sure you have a Glue account.
- b. File the form for and obtain a breadboard for course circuit constructions.

There should be five working computers with DAQ and GPIB in Room AVW 1334.

The remaining tasks for the first four 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 curve tracer 577-177-D1 – as there is only one of these, students 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. Record forward and reverse betas and currents at several  $I_B$ , VCE points for later comparisons.
2. Run the LabView tutorials and become familiar with LabView capabilities.
3. On any of the 417 Lab computers, first check the data acquisition card by going through the eight steps listed in the DAQ Quick Start Guide.
4. Configure the DAQ input and output terminals using conventional DAQ in the NI Measurement and Automation configuration program.
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 and obtained via Spice. 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 change the statement  $vs=bi+it*bs$ ; to  $vs=(it!=0)bi=it*bs:bi;$ ]
6. Run a curve for one value of  $I_B$  on the GPIB controlled oscilloscope and save the data; again compare with the data from the LabVIEW, Tektronix curve tracer, and Spice.

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

### Some Other Information

To learn LabView

- a) run the LabVIEW tutorials
- b) go through Getting Started with LabVIEW
- c) start Exercises.pdf from the icon on the desktop and begin with Exercise 1-1.  
This will need you to start also from the icon LabVIEW7.0  
Then Open VI, Examples, apps, freqresp.lib, Frequency Response vi

. After about 1 hour 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).

Next close the PCI-MIO-16E4 interface and turn on the two GPIB connected Tektronix scopes and set their addresses to different values (on the scope use utility, options, GBIP setup and address). Under Devices and Interfaces choose GPIB0, instruments shows information about the scopes.

After getting used to the DAQ then switch to the Laboratory Projects, starting on p. 251, of the textbook. "Analog Electronics with LabVIEW" (for P1.1 choose two resistors and connect the circuit of p. 252 to the DAQ board; be sure the resistors are large enough that the rated current will not be exceeded).