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ENEE 417 Experiments Weeks 1 & 2
Weeks starting 01/~~29~~-05/19 and 02/~~05~~-12/19

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 and GPIB in Room 1334.

The main tasks for the first weeks are to learn device curve tracing, LabVIEW, automated data acquisition via the DAQ board, the GPIB bus, 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, you should 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 IB, Early voltage, KP, VTO, etc. for later comparisons.

2. Learn LabVIEW by working through 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.

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 vs=bi+it*bs; there may also be an error in an inequality statement]

6. Run curves for several values of base current IB and save the data on the oscilloscope's USB port or in te 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 ID 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).

{ This is no longer available since the GPIB has been removed from the lab.Next close the PCI-MIO-16E4 interface and turn on the two GPIB connected Tektronix scope and set the address so it is different from any other value on the GPIB (on the scope use utility, options, GBIP setup and address). Under Devices and Interfaces choose GPIB0, instruments which shows information about the scopes}.

[as this is out of print there are copies in the lab]..

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After getting used to the DAQ then switch to the Laboratory Projects, starting on p. 251, of the book. "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)].