

A group of approximately 25 students and one professor are posed for a group photo in a classroom or laboratory. They are standing in several rows, some behind desks. The background features a chalkboard with some faint writing. The overall scene is brightly lit, and the image has a slightly faded, semi-transparent appearance.

Professor Linden McClure

Independent Study: USB, PCB, and High-Speed Digital Design

In this independent study, students investigate areas of electrical and computer engineering that are important to current and future embedded system designs. Students learn about the Universal Serial Bus (USB), analyze USB protocol traces captured in a laboratory setting, and design their own USB peripheral. Students also learn how to design a printed circuit board (PCB) using surface mount and through hole technology. Other students investigate high-speed digital design issues, such as signal integrity, impedance control, and high-speed signal propagation. Projects in this independent study course have been enabled by a grant from the CU Engineering Excellence Fund (EEF) and donations from Cypress Semiconductor. The professor's time is donated.

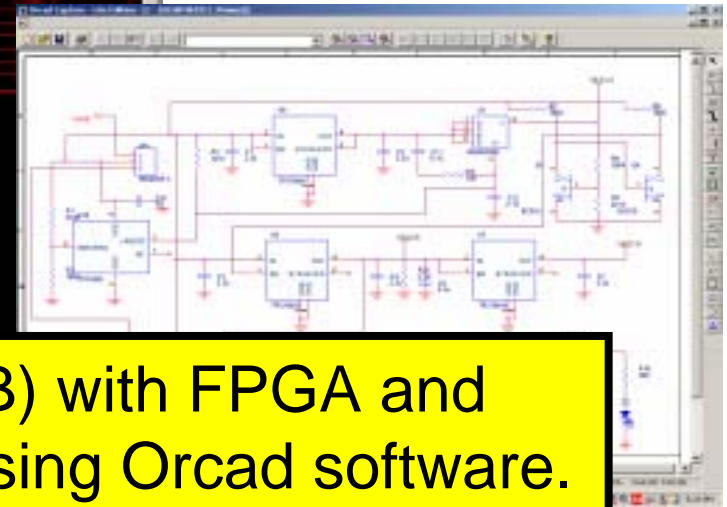
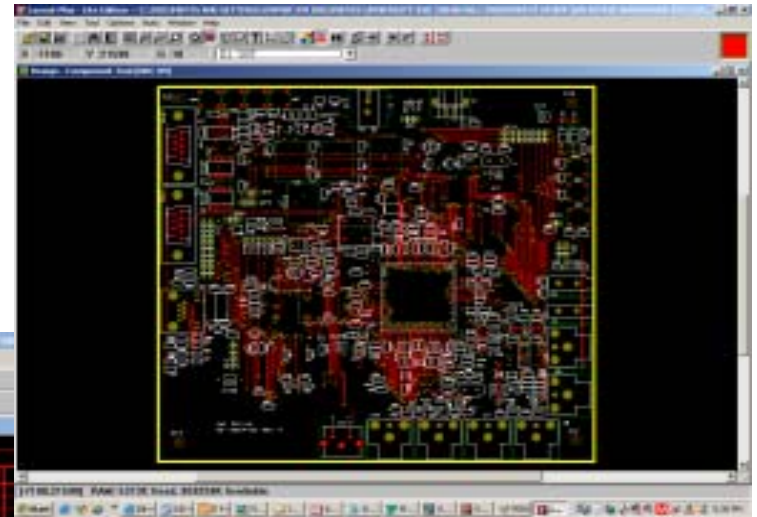
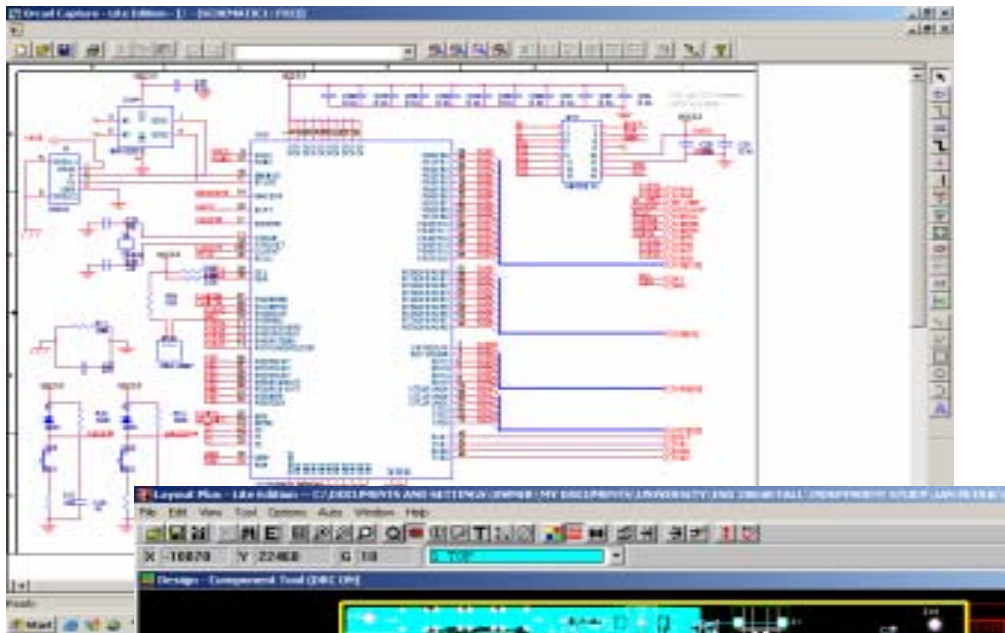
CATC USB Protocol
Analysis Software

Student-Designed
USB Peripheral

Cypress EZ-USB FX
Development Board (Kit),
with Student-Developed
Compact Flash Interface

CATC USB
Protocol
Analyzer

USB development hardware and software



USB 2.0 Printed Circuit Board (PCB) with FPGA and video chip designed by a student using Orcad software.

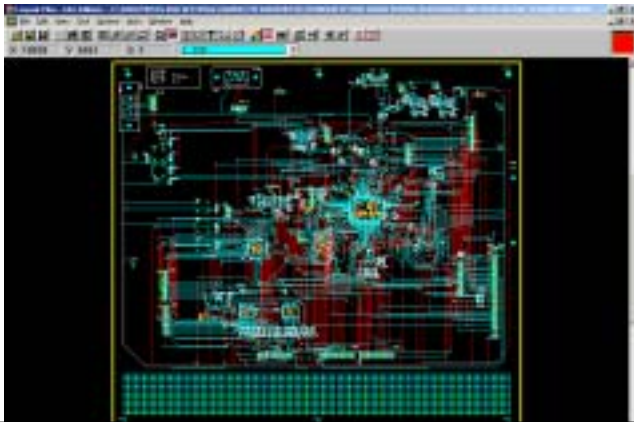
Student Project Pictures



USB 1.1 Compact Flash Reader



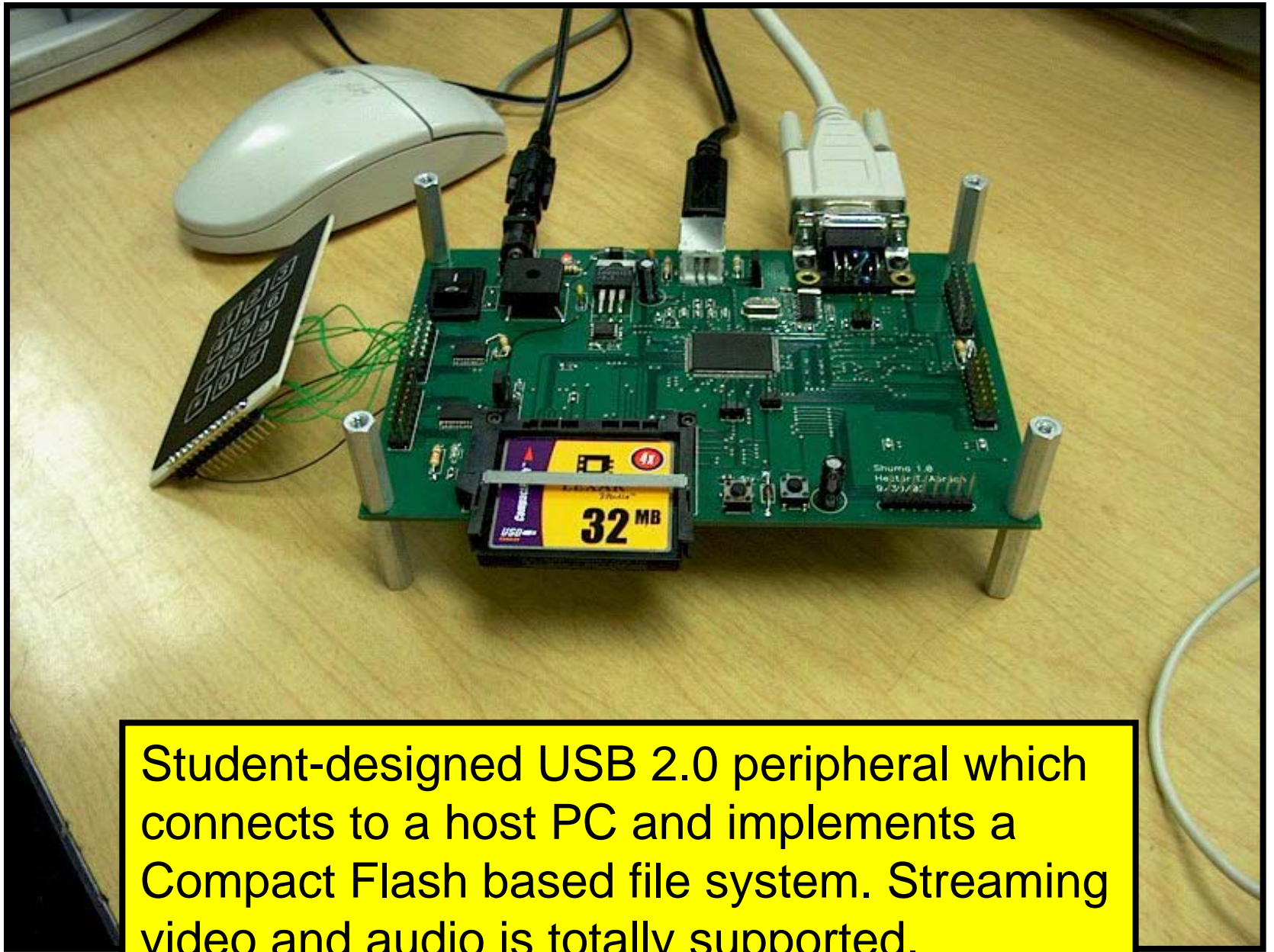
Signal Integrity Analysis Board



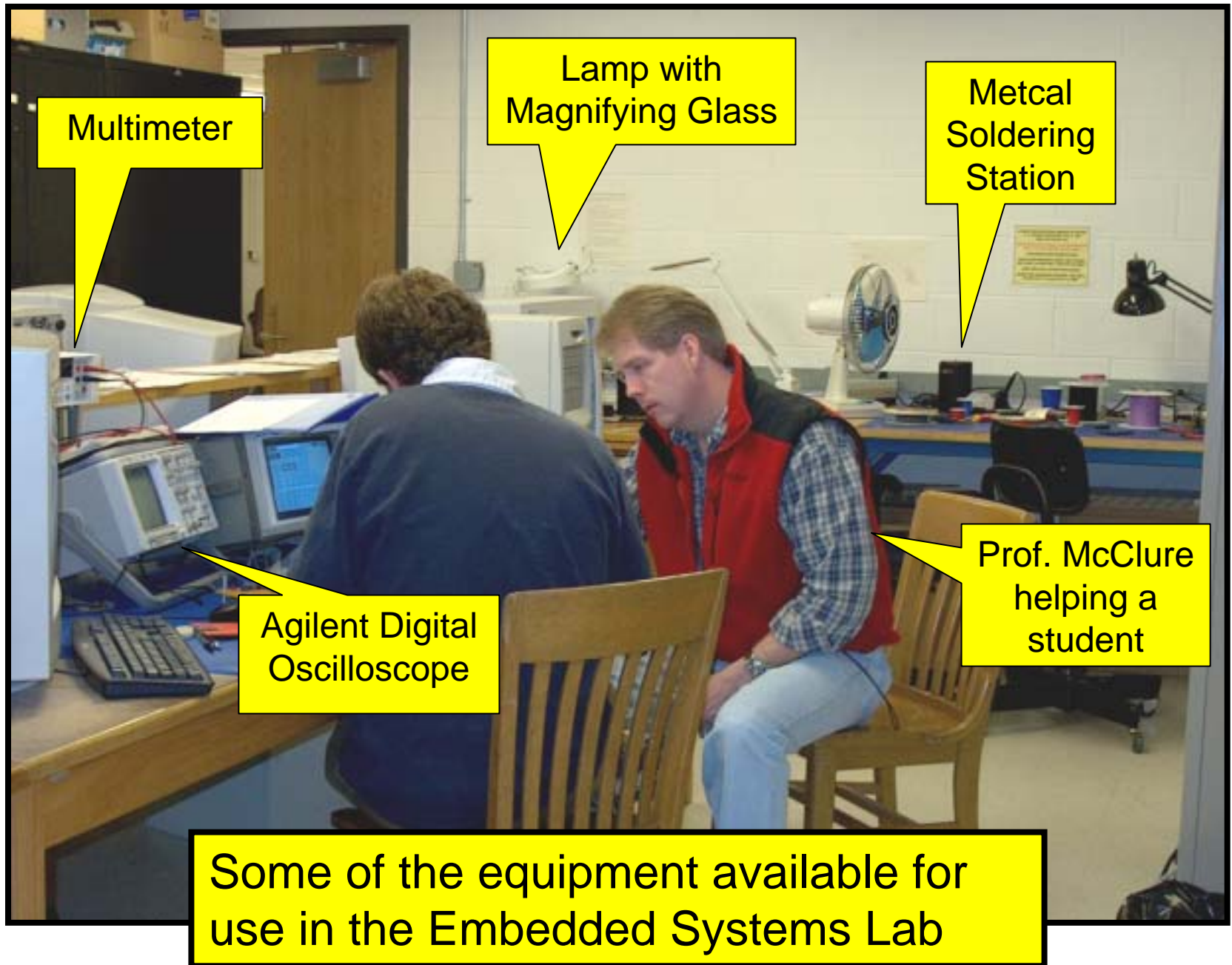
Prototype USB Mouse Layout



USB 1.1 Experiment PCB Layout



Student-designed USB 2.0 peripheral which connects to a host PC and implements a Compact Flash based file system. Streaming video and audio is totally supported.



Multimeter

Lamp with
Magnifying Glass

Metcal
Soldering
Station

Agilent Digital
Oscilloscope

Prof. McClure
helping a
student

Some of the equipment available for
use in the Embedded Systems Lab