

Embedded Systems Independent Study Possibilities for Fall 2005

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ECEN 48x0/58x0

- Design a PCB with Orcad that can be used to demonstrate various aspects of signal integrity. Aspects include rise/fall time effects, crosstalk, termination techniques, measurement techniques. Locate and use a free impedance calculator on the web. Write several experiments that can be done with the board.
- Develop a PCB design course module that explains how to use Orcad and/or Protel to design schematics, manage a parts library, lay out a PCB, order a PCB, and verify a PCB. Use the existing documentation as a starting point. Generate a list of PCB companies and their relative strengths and weaknesses. Design an SMT prototyping adapter board with support for multiple types of SMT components, with each component pad connected to a header pin.
- Develop a USB peripheral that can communicate with Windows 2000 or Windows XP, perhaps using the HID class drivers. Demonstrate that data can be sent to and received from the device through an application program running on the host computer. Use a USB protocol analyzer to examine USB transactions between a host computer and an arbitrary USB device.
- Design a low cost USB development board based on the Cypress EZ-USB FX and PSoC chips. Demonstrate how to program the PSoC device in-circuit.
- Design a device programmer with a USB interface that allows hex record files to be downloaded into the programmer, and some set of devices to be programmed, including various 8051-based chips.
- Explore software tools and development environments for writing code for USB devices and for debugging USB peripherals. Write a report and tutorial.
- Design a PCB with Orcad that can be used with two or more different 8051-based processors and at crystal frequencies of 24MHz or greater. Include a digital logic probe in the PCB design. Get the PCB manufactured and verify its operation. Develop and demonstrate in-circuit programming capability for an 8051 with integrated flash memory.
- Design a USB function generator that can accept arbitrary waveforms from the host PC and output one or more analog signals. Perhaps have the waveform be controlled by an Excel spreadsheet using Visual Basic.
- Design a USB video capture and playback system that can digitally record from a VCR and play back to a TV.
- Learn how to use the SDCC compiler with the C501 and with the Cypress EZ-USB FX chips. Develop additional documentation supporting the use of this SDCC tool set so that it can be used in ECEN 4613/5613.
- Buy a Silicon Laboratories [Cygnal] development kit. Learn how to use the development environment. Explore all features of the processor and write code to exercise all features. Integrate the Dunfield/SDCC development tools into the Cygnal IDE.
(<http://www.silabs.com/products/microcontroller/>)