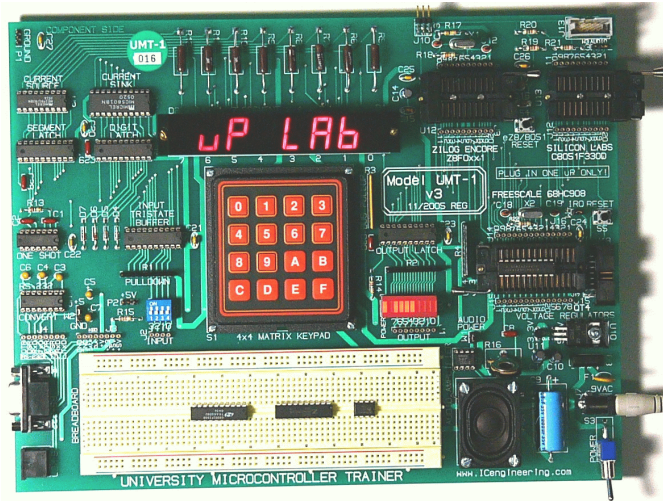


University Microcontroller Trainer (UMT-1)

The UMT-1 provides a hardware platform to teach microcontroller programming and to program chips for use in other projects. It is designed for *practical* classroom and laboratory use. Students learn a variety of microcontrollers to better gain a feel for generic concepts without sole reliance on a single semiconductor manufacturer's architecture.



Students can learn the microcontroller subject matter in a formal class and lab setting, making use of the board's I/O hardware and interface software; and subsequently use the UMT-1 as a design and test platform to program microcontrollers for use as control elements in later project-based courses.

UMT-1 Features

- Supports four 8-bit flash (reprogrammable and nonvolatile) microcontrollers:
 - Freescale 68HC908JK3 (DIP-20)
 - Silicon Laboratories C8051F330D (DIP-20)
 - ZiLOG Z8F0421 (DIP-20)
 - Freescale 68HC908QT4 (mini DIP-8)
- Utilizes industry standard software supported by the respective microcontroller manufacturer:
 - Observe/modify registers and memory locations
 - Single-step code
 - Breakpoints
 - Download to microcontroller flash memory
 - (The accompanying textbook teaches how to program the microcontrollers in assembly language, but the software provides for C programming as well.)
- Durable construction for student use and reuse:
 - 8.5 x 11 inch size
 - Circuit board is 1/8 inch thick!
 - Almost all parts are socketed for easy repair/replacement – parts list/vendor sources included
 - Gold plated ZIF (zero insertion force) microcontroller sockets enhance contact reliability
- Input/Output hardware common to all microcontrollers:
 - Eight 7-segment LED displays
 - Eight individual LED's with output port jacks
 - 16-button keypad (0-9, A-F)
 - Four dipswitch inputs with input port jacks
 - Audio amplifier with speaker
 - RS-232 interface (DB-9)
 - PS/2 keyboard interface
- Solderless prototype breadboard
- Provides regulated +5v and +3.3v, and unregulated +11v supplies
- PTC (automatically resettable) fuse
- Interface ports for each of the three microcontroller manufacturers' debug pods
- Common I/O interface subroutines provided for each microcontroller
- Powered by 9 VAC adapter

More info at:

www.ICEngineering.com/umt

410-363-8748

Textbook: **MICROCONTROLLER LAB**

Programming the 68HC08, 8051, and eZ8 in Assembly Language

In conjunction with the UMT-1 Trainer, the text provides a complete two semester hands-on undergraduate laboratory course.



The author has been designing and constructing microprocessor based systems since the 4004, while teaching Microprocessor Lab in the Electrical and Computer Engineering Department at The Johns Hopkins University for twenty years.

ISBN 0-9772246-1-9 (second edition, 216 pages)

This is a two-semester undergraduate course in microcontrollers. Go to www.ICEngineering.com/umt for a pdf document of the Table of Contents and other preview material. Generic information on the 68HC908JK3, C8051F330D, Z8F0421, and 68HC908QT4 is provided along with excerpts from the manufacturer documentation sufficient for students to program these parts with no additional references required. Students begin with sample programs for each processor (which the instructor can download from the website) to get familiar with the architecture and programming language. Some of the hands-on assignments are:

- LED output
- Switch/LED shift register
- 25-96 digit Decimal Calculator (addition)
- Traffic Signal with State Transition Lookup Table
- External interrupts
- HH:MM:SS Clock (timer interrupt driven)
- Mini Terminal (serial interface)
- PWM Lamp Control
- Function Generator (using DAC output)
- Voltmeter (using ADC)
- Thermometer (using internal chip sensor)
- Analog Data Sampling and Storage
- Keyboard Logger

The assignments are intended to cover basic assembly language programming for each microcontroller family; simple input/output port operations; interrupts; timers; asynchronous serial communication; digital-to-analog and analog-to-digital conversions; and flash programming.