NMK32203 - Microcontroller

Note20241017 *This page is being updated - work in progress...*

This course is *Microcontroller*, offered by the Faculty of Electronics Engineering & Technology.

Announcements

[20241017] Updating this for 202425s1 Academic Session.

Lecture Slides

- Lecture 1 - Overview
- Lecture 2 - Architecture

Codes (discussed in class)

Introduction to using 'library' code. Single header include file(s) meant for single source compilation. These are meant to be compiled using Keil 8051 compiler.

Library: Serial (UART)

uart.h

```
#ifndef __MY1UART_H__
#define __MY1UART_H__

/* note: this is NOT compatible with keil's printf */
void uart_init(void) {
    SCON = 0x50;
    TMOD &= 0x0F;
    TMOD |= 0x20;
    TH1 = 253;
    TR1 = 1;
}

void uart_send(unsigned char sdat) {
    SBUF = sdat;
    while (TI==0);
    TI = 0;
}
```

```
unsigned char uart_read(void) {
    unsigned char rdat;
    while (RI==0);
    rdat = SBUF;
    RI = 0;
    return rdat;
}

void uart_puts(char* text) {
    while (*text) {
        uart_send(*text);
        text++;
    }
}

#endif /* __MY1UART_H__ */
```

Library: Text LCD

tlcd.h

```
#ifndef __MY1TLCD_H__
#define __MY1TLCD_H__

#define LCD_DATA P2
sbit LCD_RS = P0^7;
sbit LCD_RW = P0^6;
sbit LCD_EN = P0^5;

void tlcd_delay(unsigned char step) {
    unsigned int loop;
    do {
        loop = 1000; while (--loop);
    } while (--step);
}

void tlcd_write(unsigned char cdat) {
    LCD_RS = 1;
    LCD_RW = 0;
    LCD_DATA = cdat;
    LCD_EN = 1;
    LCD_EN = 0;
    tlcd_delay(1);
}

void tlcd_cmd(unsigned char ccmd) {
    LCD_RS = 0;
    LCD_RW = 0;
```

```
    LCD_DATA = ccmd;
    LCD_EN = 1;
    LCD_EN = 0;
    tlcd_delay(2);
}

void tlcd_init(void) {
    tlcd_cmd(0x38); /* 8 bit mode, 1/16 duty, 5x8 font */
    tlcd_cmd(0x38);
    tlcd_cmd(0x38);
    tlcd_cmd(0x06); /* display off */
    tlcd_cmd(0x0c); /* display on, blink cursor on */
    tlcd_cmd(0x01); /* clear display */
}

void tlcd_puts(char* text) {
    while (*text) {
        tlcd_write(*text);
        text++;
    }
}

#endif /* __MY1TLCD_H__ */
```

Library: Timer

timer.h

```
#ifndef __MY1TIMER_H__
#define __MY1TIMER_H__

// useful macro!
#define timer0_init() { TMOD &= 0xF0; TMOD |= 0x01; }
#define timer0_prep(hi,lo) { TH0 = hi; TL0 = lo; }
#define timer0_stop() { TR0 = 0; TF0 = 0; }
#define timer0_exec() { TR0 = 1; }
#define timer0_flag() { timer0_exec(); while (!TF0); }
#define timer0_wait(hi,lo) { timer0_prep(hi,lo); timer0_flag();
timer0_stop(); }
#define timer0_null() { TH0 = 0; TL0 = 0; }
#define timer0_read() ((unsigned int)TH0<<8)|TL0

void timer0_delayms(unsigned int step) {
    do {
        timer0_wait(0xfc,0x66); // 1 ms delay
    } while (--step);
}
```

```
#endif /* __MY1TIMER_H__ */
```

Test Codes

These are not meant for class - just something I use to test boards/modules.