

# E C E 353: Introduction to Microprocessors

## FINAL PROJECT

### 1 Overview

Using the ECE353 carrier card and TI Launchpad, you will design and implement a game or other type of visual display using the concepts presented in class. You can choose your project from the example projects listed in this document or one of your own. Each design will be evaluated based on the requirements found in the requirements definition on the next page.

Each group will submit video clip that is between 2-4 minutes that illustrates what their project does and highlights the most important technical achievements of the project. The video should be informal yet display your technical abilities.

#### 1.1 Expectations

All of the code used for this project, with the exception of the PLL initialization code, is to be developed by your group. You **may** use code that was provided as solutions to homework, the textbook, or in class exercises. You **may NOT** use library routines provided by the ECE353 staff or code found anywhere else on the web. If you have a question about what you can and cannot use, please ask.

#### 1.2 What to Turn In

- All project files used to generate your project executable
- Video clip explaining how your project is intended to operate

#### 1.3 Example Projects

- N – Segment scrolling display
- 2 Player Pong
- Etch a Sketch
- Battle Ship
- Tank
- Snake
- Space Invaders

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## 1.4 Project Requirements

| Requirement Description  | Points Allocated | Points Earned |
|--|------------------|---------------|
| <b>ADC</b>   |                  |               |
| ADC is sampled in 1ms intervals using a timer interrupt                    | 8                |               |
| <b>Sub Total</b>   | <b>8</b>         |               |
| <b>UART2 and /or UART5</b>   |                  |               |
| U2 and/or U5 are configured for 115200 Baud, 8-n-1 with Rx & Tx interrupts | 10               |               |
| Data is transferred between two MCUs                                       | 10               |               |
| <b>Sub Total</b>   | <b>20</b>        |               |
| <b>UART0</b>   |                  |               |
| Used for serial debug. 115200 baud with/without interrupts                 | 3                |               |
| <b>Sub Total</b>   | <b>3</b>         |               |
| <b>SPI</b>   |                  |               |
| SPI Interface is configured for 2MHz                                       | 2                |               |
| SPI Interface can read/write to EEPROM                                     | 5                |               |
| EEPROM is used to resume an activity after power up                        | 5                |               |
| <b>Sub Total</b>   | <b>12</b>        |               |
| <b>GPIO</b>  |                  |               |
| A minimum of 2 push buttons are used                                       | 2                |               |
| Pushbuttons are debounced  | 3                |               |
| LEDs intensity can be modified via PWM                                     | 4                |               |
| Display colors using PWM   | 6                |               |
| <b>Sub Total</b>   | <b>15</b>        |               |
| <b>Timers</b>  |                  |               |
| Use SysTick timer with interrupts  | 1                |               |
| Use TimerA as a 32-bit count down timer with interrupts                    | 3                |               |
| TimerA interrupts are used to de-bounce push buttons                       | 2                |               |
| Watchdog timer is cleared by remote Launchpad                              | 6                |               |
| <b>Sub Total</b>   | <b>12</b>        |               |

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| Coding Style  |            |  |
|---|------------|--|
| Code is well commented                                      | 2          |  |
| Code is modularized and well organized                      | 3          |  |
| ISRs coordinate activities in a top/bottom half arrangement | 5          |  |
| Single image loaded on both MCUs                            | 3          |  |
| <b>Sub Total</b>  | <b>13</b>  |  |
| Overall Project   |            |  |
| Creativity  | 5          |  |
| Completeness of design                                      | 5          |  |
| <b>Sub Total</b>  | <b>10</b>  |  |
| Video   |            |  |
| Video is between 2 and 4 minutes                            | 3          |  |
| Instructions are complete and concise                       | 4          |  |
| <b>Sub Total</b>  | <b>7</b>   |  |
| <b>Total</b>  | <b>100</b> |  |