

# ECE 251: Introduction to Microcontrollers and IoT

IN

OUT

## Concepts:

- Number and character representations
- Components of a microcontroller
  - CPU, register model
  - I/O subsystems
  - Memory subsystems
- Computer Instruction Set
- C and Assembly Language programs
  - Math and logical instructions
  - Data transfer instructions
  - Programming techniques, flowcharting
  - Using subroutines and stacks
- I/O Capabilities
  - Parallel and serial I/O
  - Memory mapped I/O, I/O programming
  - Interfacing simple devices: pullup resistors, LED biasing, 7-segment display circuitry
  - Interrupt I/O: hardware and interrupt software
- Memory interfacing: logic, timing, and physical

## Applications:

- Use of Microprocessors for computational and I/O tasks in stand-alone and embedded systems

## Tools:

- Assembler and C Compiler
- Debugger

## Number Systems

- Understand number systems
- Understand 2's complement representation and manipulation

## Combinational and Sequential Logic

- Understand Boolean algebra
- Understand gate level design
- Understand finite state machines

## Memory

- Have a basic understanding of structure and behavior of ROM and RAM devices

## Pre-requisites

- ECE 102 with minimum grade of C

## Microprocessor Systems

- Understand major components of a microprocessor system

## Instruction Sets and C/Assembly Programs

- Know basics of C language, assembler and microprocessor instruction set
- Write programs to perform computational and I/O tasks

## Interfaces

- Write interrupt handlers and perform interrupt I/O

## Clocks. A/D. Serial I/O

- Program and use internal I/O devices (e.g. real-time clock, timers, A/D converters, serial I/O)
- Understand various serial I/O protocols, including UART, SSI, SPI, I2C