CSC 330A   Microcomputing Systems   4 cr.

Catalog description:
The technology and functions of the microprocessor chip are discussed. Several different architectures are compared. Control functions, real-time techniques, interrupt processing, multiprocessing, and input/output operations are discussed from the microprocessor point of view. The role of high-level programming languages in microcomputer systems is treated. One or more specific microcomputer instruction sets will be used for programming assignments. Three lecture hours and two hours of scheduled laboratory per week. Not open to students who have received credit for CSC 330.

Prerequisite: CSC 260.

Goals:
The purpose of this course is to introduce students to different microcomputer and microcontroller architectures, functions, and programming. More specifically,

CG01: to present an assortment of computer architectures and explain the differences among them;
CG02: to explain the functional parts of a microprocessor, including the ALU, control, memory, I/O, and buses;
CG03: to present the various parts of a microcontroller and the microcontroller units that are present in addition to the standard microprocessor configuration;
CG04: to present the instruction set of at least one simple microprocessor and the elements that are used to perform sequence, selection, and looping patterns;
CG05: to discuss problems associated with microcontrollers and their use in controlling simple functions and processes of a microcomputer chip.

Objectives:
Upon successful completion of this course, a student will have demonstrated the ability to:

CO01: diagram the configurations of the architecture of 16-, 32-, and 64-bit microprocessors;
CO02: explain the functional characteristics of the ALU, control unit, memory, I/O, and buses;
CO03: discuss analog-to-digital and digital-to-analog conversion, clocks, and counters;
CO04: write simple programs for microcomputers using the sequence, selection, and loop patterns expressed in the microprocessor machine language;
CO05: write simple programs for microcontrollers which detect and decode sensors and activate a proper response output.

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Topics:
- Essential elements of a computer
  - Arithmetic/Logic Unit (ALU)
  - input/output (I/O) elements
  - memory element
  - Control Unit element
- Microprocessor: Most of a Computer on a Chip
  - microprocessor buses
  - microprocessor ALU, I/O, and Control elements
- Single-chip microprocessors
- Microcontrollers: I/O-oriented single-chip microprocessors

AR1(1), AR2(1), AR4(2), AR6(4), AR5(3)
- microcontroller I/O
- interrupts
- ALU
- timers
- parallel and serial I/O
- external devices
- configurations of microprocessors and microcontrollers

- Computer instruction set
  - desirable characteristics of instruction sets
  - instruction formats
  - addressing modes
  - SISC, RISC, and CISC

- Task-oriented instructions
  - instructions for business, text processing and data manipulation
  - scientific-oriented instructions
  - control-oriented instructions

- Microcontroller Unit (MCU) instruction sets
  - a comparison of four MCU instruction sets
  - I/O instructions
  - arithmetic instructions
  - bit-manipulation instructions

- Microcontroller software implementation
  - software development procedures
  - real-time process control
  - conversion from Petri Table to software
  - interfacing C and assembly language

Assignments:
There will be extensive laboratory assignments with one or more specific microcontrollers such as the ??? Motorola MC68HC 11, Intel MCS-51 or Texas Instruments TMS370 ???. There will also be periodic written assignments.

Examinations:
There will be two one-hour examinations given in class, and a comprehensive two-hour final examination given during the scheduled final exam period.

Grading:
Final grades will be determined using the following approximate weights: written homework, 20%; lab experiments, 40%; hour examinations, 10% each; final examination, 20%.

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