

Introduction to Microcontrollers with applications of Fuzzy Logic - Syllabus

Teacher: Mr. Evans

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Webpage: www.scienceandmathacademy.com/academics/microcontrollers/



Text: None. PICBASIC PRO Compiler manual and PIC16F690 specifications document, and other specification sheets.

Course Description: The focus of this course will be programming microcontrollers to be used in robotics applications. Fuzzy logic will be used in the programming of the microcontrollers (not a major part of the course). Students will build and program a functioning robot in the course. At most times students will be working in pairs to complete major assignments.

Course Outline: The following is an outline of the topics we will cover.

Lecture topics (This is not a complete list, only a sample.)

- Schematics
- Components
- Soldering
- PICBasic Commands
- Infrared (IR) (basics and transmission protocol)
- Gyroscopes (possible)
- Inclinometers (possible)
- Thermometer LM34
- Encoders
- Servos
- H-bridges
- LCD displays and Hitachi 44780 controllers
- ADC
- Fuzzy logic

Projects:

- Wire breadboard for PIC16F690
- LED control
 - Blink
 - count in binary
 - count on 8-segment LED
 - dim (use LabQuest w/ light sensor, use oscilloscope for voltage)
 - Experiment with internal and external oscillators
- Output to an LCD
 - Solder LCD display
 - Simple text
 - DIP-8, binary (from DIP switch) to decimal on LCD
 - SERIN and oscilloscope

- Digital thermometer
- Sound to a speaker
- Motor control
 - H-bridge
 - PWM
 - External motor controllers
 - Servo motor control
- IR
 - Make an IR-remote
 - Make an IR-receiver
- Motor encoders – move according to encoder output
- Inclinometer - Measure angle
- Gyroscope – estimate position
- Combine everything to program a two-wheel balancing robot

Grading:

- Projects: The majority of points will come from projects. Projects will include programming and wiring a circuit on a solderless breadboard.
- Class assignments: There will be some in-class assignments to reinforce concepts from lectures.
- Homework: Homework will be minimal. I will have some required reading at times and you may have to write some programs at home.
- Quizzes: To ensure that all students understand the programming, there will be period quizzes.

Classroom Expectations:

- Be on time. Sharpen your pencil if necessary and get in your seat before the bell rings. If you are not in your seat when the bell rings, you are late.
- Be prepared for class.
- You will not be permitted to go to your locker during class.
- Use of the bathroom is a privilege that is allowed at the discretion of Mr. Evans. You will be permitted to use the restrooms on the third floor only.
- Make up work will be given for excused absences only. You will be allowed to make-up missed work according to the HCPS policy. It is your responsibility to see the teacher for the assignment.
- All work must be on time to be accepted for credit. Field trips, rehearsals, or any other absences known in advance are not an excuse for late work. Submit it early or give it to a classmate to submit it for you.
- Students may only use a computer when directed by Mr. Evans.
- You must clean up all supplies prior to leaving the classroom.