ELEC-137 Microprocessors
Outline of Instruction

Course Information
Organization Monroe County Community College, Applied Science and Engineering Technology
Development Date 10/27/2006
Course Number ELEC 137
Potential Hours of Instruction 90
Total Credits 4

Description
This course is devoted to assembling and programming microprocessor/microcontroller systems with an emphasis on using the 68HC11 microcontroller. Covered are: computer architecture, memory types, interfacing techniques and components, and machine-language programming. Flowcharting, computerized program assembly, and proper hardware and program documentation are emphasized. Lab projects include, but are not limited to, an electronic "player-piano", programmable timing circuits and an autonomous robot.

Major Units
1. Computer Math
2. Intro to Computer Hardware
3. Intro to Computer Software
4. 68HC11 Programming
5. Branching and Loops
6. Indexed Addressing
7. Subroutines
8. Program Assemblers
9. Memory Mapping and Address Decoding
10. Parallel I/O Devices
11. Interrupts and Reset
12. Analog & Serial I/O

Types of Instruction

<table>
<thead>
<tr>
<th>Instruction Type</th>
<th>Contact Hours</th>
<th>Credits</th>
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<tr>
<td>Lecture/Lab</td>
<td>90</td>
<td>4</td>
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Textbooks

Learner Supplies
Prerequisites
ELEC 135

Exit Learning Outcomes

Program Outcomes
A. Acquire and apply technical expertise in the areas of Circuit analysis, Analog electronics, Digital electronics, Microprocessors, and Communication systems.
B. Utilize Virtual Instrumentation, Data Acquisition (LabView), CAI, Schematic Capture and Test and Applications software packages to refine skills and to analyze and design various electronic circuits.
C. Develop and Demonstrate Problem Solving Skills.
D. Develop a willingness to learn independently.
E. Develop and demonstrate effective wiring and laboratory skills.
F. Demonstrate Equipment/Instrumentation Competence
G. Value Safety Training, Safe Work Practices and acknowledge Safety Standards

General Education Outcomes
A. Demonstrate an understanding of the process of scientific inquiry
B. Apply mathematical approaches to the interpretation of numerical information
C. Apply mathematical approaches to the analysis of numerical information
D. Use computer technology to retrieve information

Course Outcomes
1. Identify data types: op code, address, bits, bytes, nibbles, and words and user data, giving examples and subtypes
2. Identify memory types SRAM, DRAM, ROM, EPROM, EEPROM and addressing modes, giving characteristics of each.
3. Recognize condition-code flags set by and sensed by specified 68HCII instructions, given the programmer's reference sheet
4. Identify latches, buffers, decoders, multiplexers, and analog-digital converters
5. Demonstrate the conversion of any positive number from 0 to 64000 from binary to decimal to hexadecimal representation
6. Demonstrate addition and subtraction of positive numbers from 0 to 64000 in the binary or hex number systems
7. Demonstrate the conversion of negative numbers from -1 to -128 to their two's-complement binary equivalents
8. Write assembly-language source code for various 68HCII programs, including comments, given a program flow chart and hand assemble into object code
9. Enter a source program into a host computer, compile it, correct errors, and print machine-assembled object code
10. Calculate the delay for a program loop, nested loop, or timer-interrupt routine, given the source code and the processor clock speed
11. Construct various lab projects that require interfacing techniques
12. Construct and program an "autonomous" robot to accomplish various tasks