Eastern WV Community & Technical College
Master Course Record

Course Prefix and Number: ELM 208

Course Title: Microprocessor Fundamentals

Recommended Transcript Title: Microprocessor Fundamentals

Date Approved/Revised: June 18, 2008

Credit Hours: 4
Contact hours per week (Based on 15 week term):
Lecture: 3
Lab: 3

Prerequisite: ELM 207 – Fundamentals of Digital Electronics or permission of Academic Program Director for Industrial Technologies.
Corequisite:
Pre/Corequisite:

Grading Mode: Letter grade

Catalog Description: This course introduces the student to the theory, operation and application of microprocessors. Binary, octal and hexadecimal numbering systems will be covered. The operation of the central processing unit (CPU), memory, data buses and input/output (I/O) circuits will be studied. Basic assembly language programming and data transfer will be covered. Students will also learn basic troubleshooting techniques.

Course Outcomes:

1. Compare the function of the micro-, mini-, and mainframe computers.
2. Compare the advantages/disadvantages of a microprocessor to hardwired logic.
3. Sketch a functional block diagram of a simple 8-bit microprocessor.
4. Compare the operation of a microprocessor and a microcontroller.
5. Compare the function of ROM, PROM, EPROM and Flash EPROM.
6. Contrast the function of static and dynamic memory.
7. Sketch and identify the CPU register architecture.
8. Describe the function of the ALU.
9. Describe the function of the CPU.
10. Describe the function of I/O.
11. Compare the function of the PIA and ACIA.
12. Sketch a block diagram illustrating the register structure of the PIA.
13. Sketch a block diagram illustrating the register structure of the ACIA.
14. Describe the bus structure for the 6800 family including data, address and control.
15. Compare the 3-state bus with typical binary state logic.
16. Distinguish between a baud rate, bit rate and data rate.
17. Draw a timing diagram illustrating asynchronous data transfer.
18. Draw a timing diagram illustrating synchronous data transfer.
19. Describe the function of a parity bit.
20. Sketch a memory timing cycle for a write cycle.

21. Sketch a memory timing cycle for a read cycle.
22. Describe handshaking operations.
23. Compare the operation of MAR and MDR.
24. Compare the function of the program counter, the instruction decoder and the accumulators.
25. Compare the functionality of the family of 6800 components (6800, 6830, 6810, 6820 and 6850).
26. Describe the function of the stack and stack pointer.
27. Sketch a block diagram of a simple cascade stack storage structure.
28. Compare the use of machine language, assembly language and high-level languages.
29. Sketch a flow chart for a simple program.
30. Sketch the data flow through a hypothetical microprocessor during the execution of a simple program.
31. Design a simple program using assembly language to clear available memory.
32. Assemble a simple assembly language program into machine code.
33. Compare immediate, direct, indexed, implied and extended addressing modes.
34. Compare the H, N, Z, V, C and I condition codes.
35. Sketch a timing diagram for the reset function.
36. Sketch a timing diagram for an interrupt function.
37. Compare the advantages of using interrupts vice using scanning techniques.
38. Compare the operation of IRQ, NMI and SWI interrupts.
39. Categorize the 6800 instruction set as data moving, arithmetic, logic, control and special purpose.
40. Compare the function of the COMPARE and TEST instructions.
41. Compare the function of the INCREMENT and DECREMENT instructions.
42. Compare the function of the index, program counter, stack counter and code condition registers.
43. Compare the purpose of the carry, negative, zero and overflow flags.
44. Distinguish between a computer program, instruction set, op-code and mnemonics.
45. Compare the enhancements of the 6800 family microcontrollers with the original 6800 CPU.
46. Compare the advantages of the 68HC05 and 68HC08 microcontrollers.
47. Draw a block diagram and explain the operation of a 6821 PIA connected to drive 6 seven-segment LED displays.
48. Sketch a simple CPU timing diagram for various instructions.
49. Sketch a state transition diagram for the 6800.
50. Identify the op-code, number of machine cycles, and number of bytes for a given instruction.
51. Sketch a model of the stack and stack pointer and describe their function.
52. Compare the Jump and Branch instruction sets.
53. Discuss the function of the shift and rotate instructions.
54. Discuss the use and function of subroutines.
55. Write a simple program that can store and retrieve data from the stack.

56. Write programs that can add, subtract, multiply and divide.
57. Use a trace table to show the contents of the accumulator after a give instruction set.
58. Describe a method of test to block of RAM.
59. Draw a diagram showing how blocks of IK x 8 RAM and 4K x 8 ROM can be fully address decoded.
60. Describe the response sequence of a microprocessor to an interrupt.

Implementation Cycle: Spring

Role in College Curriculum:

□ **General Education Core**

Ξ **Technical Core:** Electromechanical Technology

□ **Restricted Elective**

□ **General Elective**

□ **Workforce Education**

□ **Other**

Course Fee: Yes

Instructor's Qualifications: BS Engineering/Technology or related discipline and/or expertise and experience in the field.

Expanded Course Description:
This course introduces the student to the theory, operation and application of microprocessors (CPU's). Binary, octal and hexadecimal number systems will be covered. The functions of control, arithmetic, logic and communication with external circuitry will also be studied.

Prepared by:

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Name, Title Date

Approved Per LOT Minutes

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Dean, Academic and Student Services Date