

EE380

Introduction to Microprocessors

Calendar Description: Microcomputer architecture, assembly language programming, subroutine handling, memory and input/output system and interrupt concepts. Prerequisite: E E 280 or CMPUT 329. Credit may be obtained in only one of EE380 or CMPUT 229.

Topics Covered in this Course

1. Fundamental Concepts: (1 week approx.) History of microprocessor technology, microcomputer components, CPU, memory, input/output, busses, microprocessor families, number systems, conversion algorithms, ASCII coding, parity coding.

2. Computer Architecture: (2 weeks approx.) The 68000 programmer's model, address and data registers, program counter, status register, memory map organization, 68000 native data types, simple assembly language programming, basic machine instructions, program constructs, machine instruction formats, manual instruction assembly and disassembly.

3. Addressing Modes: (1 week approx.) Immediate value, data and address register direct, address register indirect, address register indirect with post-incrementing or pre-decrementing, address register indirect with displacement, address register indirect with indexing and a displacement, long and short absolute addressing, program counter relative addressing, program counter relative with indexing and an offset.

4. Instruction Set: (2 weeks approx.) Data movement instructions; integer arithmetic instructions; logical, shift and rotate instructions; bit manipulation instructions; BCD arithmetic; conditional branching and program control; system control; multiprocessor communications.

5. Assembly Language Programming: (1 week approx.) Software design, structured programming, pseudo code.

6. Subroutines: (1 week approx.) User and supervisor stacks, branch and jump to subroutine instructions, parameter passing techniques, stack frames.

7. Parallel and Serial Input/Output: (2 weeks approx.) Parallel interface design and programming, the synchronous bus, serial interface design and programming.

8. Exceptions and Interrupts: (2 weeks approx.) Exceptions, interrupts, and interrupt processing.

9. System Configuration and Decoding: (1 week approx.) Address decoding, full versus partial decoding, memory system design and timing.

Relationship to Other Courses: Basic familiarity with digital logic hardware is assumed in EE 380, that is, the kind of background provided by EE 280 or an equivalent course in digital logic design. Assembly language programming receives the most emphasis in EE 380; however, fundamental concepts in computer architecture and operating systems are also covered. Experience with at least one computer programming course will be very helpful. Attention to detail, neatness, patience, and an organized approach to both problem solving and troubleshooting are the most useful skills to bring to the course, especially in the laboratory exercises. EE 401, CMPE 401, CMPE 382, and CMPE 490 build directly on the material in EE 380. Microprocessor technology and low-level programming concepts covered in EE 380 form useful background in many other courses in such areas as digital signal processing, robotics, process control, real-time control systems, and software compilers.

Recommended Reading

Alan Clements, *68000 Family Assembly Language*, PWS Pub. Company, 1994, ISBN 0-534-93275-4

Alan Clements, *Principles of Computer Hardware*, Oxford University Press, 2006, ISBN 0-19-927313-8

Thomas L. Harman, *The Motorola MC68332 Microcontroller: Product Design, Assembly Language, Programming, and Interfacing*, Prentice Hall, 1994, ISBN 0-13-603127-7

Evaluation Scheme

	Percentage	Component
1	10	Assignments (10)
2	15	Laboratories (4)
3	25	Midterm Exam
4	50	Final Exam