EECE.3170: Microprocessor Systems Design I

Summer 2017

Lecture 2: Key Questions
May 17, 2017

1. Describe the general characteristics of the x86 architecture.

2. Briefly describe the x86 registers.

3. Describe the different memory spaces in the x86 architecture.

4. Describe the specifics of x86 memory addressing within instructions.

5. **Example:** Compute the address for the memory operand in each of the following instructions. The register contents and variables are as follows:

- (ESI) = 00000100_{16}
- (EDI) = 00000200_{16}
- (EBX) = 00000300_{16}

a. Destination operand in: MOV [EBX+0400h], CX

b. Destination operand in: MOV [EDI+2*EBX], AH

c. Destination operand in MOV [EBX+EDI+0400h], AL

6. Describe the basic structure of an assembly language statement.

7. Describe how the x86 registers are accessed as 8-bit, 16-bit, and 32-bit values. Include the answer to the example provided in the slides (EAX = 1A2B3C4DH).

8. Describe how to determine the number of bytes being accessed from memory in an x86 instruction.

9. Describe the use of the MOV instruction.

10. The example program below shows the initialization of internal registers with immediate data
    and address information, using MOV instructions. Show the state of all affected registers.
    Also, explain why AX is used to initialize segment registers.

```
MOV  AX,2000H
MOV  DS, AX
MOV  ES, AX
MOV  AX,3000H
MOV  SS,AX
MOV  AX,0H
MOV  BX,AX
MOV  CX,0AH
MOV  DX,100H
MOV  SI,200H
MOV  DI,300H
```

11. Describe the operation of the MOVSX/MOVZX instructions. How/when are these
    instructions useful?

12. Assume: AX = 0100H, DX = 8100H, (100H) = 00H, (101H) = FFH. What are the results of
    the following instructions?
a. MOVSX EBX, AX

b. MOVSX EBX, DX

c. MOVZX EBX, DX

d. MOVSX EBX, BYTE PTR [100H]

e. MOVSX EBX, WORD PTR [100H]

13.   Explain the operation of the XCHG instruction.

14. Explain the operation of the LEA instruction.

15. **Example:** Given the initial memory state below:

	Lo			Hi
0x528000	50	88	31	A3
0x528004	B2	FF	0F	7D
0x528008	07	D0	BE	22
0x52800C	11	96	00	14

Show the results of the following short instruction sequence.

```
MOV     EAX, 528000h
MOV     EBX, [EAX+2]
XCHG    BL, BH
LEA     EDX, [EAX+8]
MOV     ECX, [EDX-3]
```