Cptr380 **Exam #1 Outline** **Winter, 2020**

The exam will be closed book. All necessary paper will be provided for you. Materials that you may use at the test are:

- Both sides of an 8½ x 11" cheat sheet that you may put anything on that you wish. Suggestions include:
  - Lecture material from chapters 1 - 4 in the textbook;
  - Content from in-class presentations (non-lecture);
  - Homework specific issues.
- Your calculator.

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1. Computer abstractions and technology
   a. Performance
      1. CPI
      2. Execution time
      3. Clock speed
      4. Clock cycles
      5. CPU time
   b. Power
2. Instructions: Language of the computer
   a. Textbook design principles
   b. MIPS instruction set architecture
      1. Instruction formats
      2. Addressing modes
      3. Register use
      4. Instruction operation
   c. Binary arithmetic
      1. Number representation (unsigned, signed, etc.)
      2. Addition
      3. Subtraction
   d. High-level vs. assembly level programming
3. Arithmetic for computers
   a. Operations on integers
      1. Addition and subtraction
      2. Multiplication and division
      3. Dealing with overflow
   b. Floating-point numbers
      1. Representation and operations
      2. Dealing with overflow and underflow
4. The processor
   a. Single-cycle datapath
   b. Multi-cycle datapath
   c. Pipeline stages
   d. Pipeline control
   e. Pipeline hazards
      1. Structural
      2. Data
         a. Forwarding
         b. Hazard detection
         c. Stalling
      3. Control – branch prediction
   f. Advanced topics

5. Appendix D – Controller design
    a. Combinational
    b. State machine
    c. Microprogramming
        1. Vertical
        2. Horizontal
6. Historical Perspectives
    a. Chapter 1 – Computer history
    b. Chapter 2 – Languages
    c. Chapter 3 – Computer arithmetic
    d. Chapter 4 – The Processor