

Spring 2012
EE 7715: Computer Arithmetic

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Text: No text. Class notes and research papers from the current literature.

Prerequisite: EE 3755 or equivalent.

Goals: To familiarize students with traditional and advanced computer arithmetic techniques. This will help the students to be able to do research in current advanced topics in computer arithmetic.

Topics:

1. Introduction to Number Systems: weighted number systems; unweighted number systems.
2. Fixed and Floating Point Systems; Basics of fixed and floating point arithmetic; the IEEE 754 floating point standard; fixed and floating point addition, subtraction, multiplication, division.
3. High Speed Addition: Fast two-operand and multioperand adders; carry Lookahead Adders; Carry Save Adders; Signed Digit Adders.
4. High Speed Multiplication/Division: Sequential Unsigned and signed multipliers; Fast array multipliers; Modular multipliers; Multipliers based on counters; Restoring/non restoring division; Array dividers; Dividers based on multiplication.
5. Residue Arithmetic: Basics of number theory; Modular fields and rings; The Residue Number System (RNS); Weighted-to-RNS conversion; RNS processing; RNS-to-weighted conversion.
6. Special Topics on Residue Arithmetic: Selecting the basis for the Residue Number System; The Quadratic Residue Number System (QRNS); The Polynomial Residue Number System (PRNS); Error detection, error correction in the Residue Number System.

NOTE: Some of the above topics may not be covered and some other topics not listed above, especially topics in recent research on Residue Arithmetic will be included.

Grading: Test 1: 25%
Test 2: 25%
Extra Assignment: 10%
Final 40%

Test Policy: If a student misses any one of tests 1 or 2 for a medical reason, then the student should provide the instructor with a doctor's statement stating that the student was sick on the day of the test. In this case, a make-up test will NOT be given but instead the remaining test will count for 37%, the extra assignment for 13% and the final for 50%.