

NEW ECE COURSE OFFERING

ECE 57X Reconfigurable Computing Using FPGAs

Schedule: **TBD - Spring 2007**
WPI Main Campus

Description:

Recent advances in VLSI technology have given rise to a new class of computer architectures which take advantage of application-level parallelism. These reconfigurable computing systems have attracted lots of attention from researchers in recent years due to its potential to greatly accelerate a wide variety of applications. Its key feature is the ability to perform computations in customized hardware to increase performance, while retaining much of the flexibility of a software solution.

In this course, we explore both hardware and software aspects of reconfigurable computing machines. Initially we review the VLSI architecture and technology of the fundamental building block of most reconfigurable computers – the field programmable gate array (FPGA). The organization of device logic and its interconnection resources determine the physical limitations of each FPGA device. Subsequently, we introduce the computer-aided design for the allocation of configurable logic components and interconnections among them, namely placement and routing algorithms. Then we consider the implementation of parallel processing on digital circuits, which gives the performance edge of customized hardware circuits over contemporary microprocessors..

This course also covers the system-on-programmable-chip (SOPC) architecture and hardware-software co-design on FPGA. The embedded microprocessors provide more flexibility and functionality for the reconfigurable computing system. Finally, we consider the issues involved in run-time reconfiguration, which reuse the configurable hardware during program execution.

The desire to efficiently solve important problems drives reconfigurable computing. Therefore, throughout this class we will discuss the applications of communications, signal processing, and scientific computing and the characteristics that make them attractive to reconfigurable computing platforms. Students will be required to complete design projects on selected reconfigurable computing applications.

Recommended Background: ECE 574: Modeling and Synthesis of digital systems using Verilog and VHDL; and/or ECE 3815: Digital System Design with VHDL, or similar

About the Instructor: This new course will be taught by Dr. Xinming Huang, of the ECE department (xhuang@ece.wpi.edu). Dr. Huang received his Ph.D. in Electrical Engineering from Virginia Tech. He also has many years of industrial experience with Bell Labs of Lucent Technologies. His current research interest includes reconfigurable computing and networked embedded systems. Prof. Jim Duckworth will serve as the advisor of this new course.