CDA 4204 CAD-Based Computer Design

Credits: 3

Text book, title, author, and year: Design Principles for Digital CMOS Integrated Circuits by Benton Calhoun, National Technology and Science Press, 2012

Reference materials: : Verilog Digital Computer Design: Algorithms Into Hardware by Mark Arnold

ISBN 978-0-12-374493-7 *Computer Organization & Design, The Hardware/Software Interface, Fourth Edition*, Patterson & Hennessy, Morgan Kaufmann publisher, 4th Edition, 2009.

Specific course information: Use of Verilog hardware description language for hierarchical behavioral level design of a CPU using current industry standards and design methodologies. Techniques for performance enhancement.

Prerequisites: Logic Design, Senior level

Specific goals for the course: Teach the design and architecture of major components of the structure of the central processing unit and memory hierarchy of modern microprocessor systems.

Use a cycle by cycle simulator to illustrate logic complexities. Students will have a number of hands-on experiments and design assignments.

Brief list of topics to be covered:

- BASIC STRUCTURE OF COMPUTERS

Functional units – Basic operational concepts

Introduction to a hardware description language (Verilog)

- BASIC PROCESSING UNIT

Performance and metrics – Instructions and instruction sequencing – Hardware – Software Interface – Instruction set architecture – Addressing modes – RISC – CISC. ALU design – Fixed point and floating point operations.

- PIPELINING

Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – Improving cache performance – Virtual memory – Memory management requirements – Associative memories – Secondary storage devices.