

# CSE 140: COMPONENTS and DESIGN TECHNIQUES for DIGITAL SYSTEMS

Instructor: *Alex Orailoglu* (Applied Physics and Mathematics Prime 4840, alex@cs.ucsd.edu)

## 1. INTRODUCTION

Design Representations. Levels of Abstraction. Design Process. CAD Tools.

## 2. DATA TYPES & REPRESENTATIONS

Number Representations. Addition, Subtraction, Multiplication, Division. Error Correction and Detection.

## 3. BOOLEAN ALGEBRA

Axiomatic Definition and Basic Theorems of Boolean Algebra. Boolean Functions. Canonical Forms. Standard Forms. Gate Implementations.

## 4. SIMPLIFICATION of BOOLEAN FUNCTIONS

Map Method. Tabulation Method. Technology Mapping for Gate Arrays. Technology Mapping for Custom Libraries.

## 5. COMBINATORIAL COMPONENTS

Adders/Subtractors. Logic Unit. ALUs. Decoders. Selectors. Buses. Encoders. Comparators. Shifters. ROMs. PLAs.

## 6. SEQUENTIAL LOGIC

Latches. Flip-Flops. FSMs. State Minimization. State Encoding. Selection of Memory Elements.