Orientation

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Purposes

• Put this class (and other classes) within the context of your career
• Understand how silicon systems are designed in a global economy
The Global Enterprise (Example)

- System Integrator
- Chip Integrator
- IP Providers
- Logic team
- Serdes/package team
- Verification team
- Design Services

High value
Low cost

Fabs
Design Flow

High Value Teams

System Concept

System Specification
- Simulatable

System Partitioning
- Modeling

Chip Specifications
- Simulatable
- Partitions Modeled
- Issues: HW, SW, physical, logic, circuit, power, performance

Low Cost Teams
Design Flow (2)

High Value Teams

Design Execution
- Against system models
- Constant monitoring of all teams

High IP / High complexity content Designs
- Design components with high novelty element
- Generation of new or modified IP by IP companies

High Value Design Services
- Complex CAD tools
- Early planning for performance attainment

Low Cost Teams

Logic Design to Spec (RTL)
Circuit Design to Spec
C, Java coding to Spec
Design Flow

High Value Teams

Verification
- System model and metrics
- Speeding up verification convergence
- Debug and repair

Performance Verification
- Achieving clock and power goals
- CAD flow management
- Debug and repair

Low Cost Teams

Coding for verification
Design Flow

High Value Teams

System Integration & Verification
- Packaging and component integration
- Prototyping and transition to manufacturing
- Debug and repair

Marketing

Low Cost Teams

Detailed Package Design and Signal Integrity Verification

Manufacturing transition and scale-up / cost-reduction
Defense and Security

Entire Design usually done in the United States

- Often using commercially provided chips, and subsystems not originally intended for defense
- Tends to emphasize
  - Unique System Integration Approach
  - Lots of embedded software
  - Lots of FPGAs
  - Specialized ultra-high-performance defense-specific components (which are often new chips)
  - All new design (logic, analog, etc.) done in the United States
What this means to you

Assuming you want a high value (i.e. high wage) job.

Defense and Security

- US Citizenship
- Wide variety of point skills particularly at high performance edge
- Develop system integration skills (breadth as well as depth, project management, etc.)

Commercial

- Have to know detailed design in order to do system design and manage design process
- Need broad knowledge in order to have system view
- Need to be on the leading edge of innovation (patents, IP, techniques)
  - PhD beneficial
- Develop deep skills in design services speciality
What this means at NCSU

Innovations in Curricula:

- Introduced ECE 745 ASIC Verification as a graduate course (deep skill set)
- Introduced ECE 720 Electronic System Level (ESL) design in Spring 2011
  - Pre-requisite: ECE 520
- Many advanced design teams demand circuit level knowledge even for digital designers (ECE 546 / 733)
- Encourage students to obtain application domain knowledge
- Encourage students to deepen software engineering skills
  - Scripting (Python/Perl)
  - C / C++