ECE 561: HW/SW Design of Embedded Systems

**Pre-requisites:**
- ECE 251 or equivalent

**Logic Design**
- Understands combinatorial and sequential logic design

**Programming Language**
- Has experience with programming in C/C++/Java and/or VHDL/Verilog

**Computer System**
- Has basic knowledge of microprocessors and memory systems

**Concepts:**
- Introduction to embedded systems on chip (SoC) design
- Embedded system specification formalisms (petri nets, UML, MSC, state charts, SDL)
- Modeling abstractions and simulation techniques
- SystemC programming
- Hardware components
  - Computation cores (microcontrollers, superscalar/VLIW processors, DSPs, FPGAs)
  - Memory (SRAM/DRAM, caches, scratchpads)
  - Communication (buses, networks on chip)
  - Analog sensors, actuators, A2D converters
- Software components
  - Real time operating systems (VxWorks)
  - Middleware (CORBA)
- Hardware/software partitioning and co-design
- Real time scheduling and timing concepts
- Design space exploration
- Validation and verification
- Fault tolerant design
- Low power and thermal-aware design

**Applications:**

**Tools:**
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**OUT**

**Embedded system design**
- Understands challenges and trade-offs between various design decisions

**Hardware components**
- Understands trade-offs between different hardware configurations and component choices

**Software Components**
- Understands real-time constraint challenges during software design

**Design with SystemC**
- Can design and simulate hardware and software components using SystemC

**Design Space Exploration**
- Can analyze the system level impact of design decisions; be able to use optimization techniques to explore and create (near) optimal configurations

**Low Power, Thermal Aware and Fault Tolerant Design**
- Understands the design techniques and trade-offs involved for low power, thermal-aware and fault tolerant design

As of 12/9/08