

# EC535: Introduction to Embedded Systems – Spring, 2009

**Instructor:** Wei Qin, PHO 336  
Office Hours: Mon 3-4pm, TR 9:30:00-10:30am  
Phone: 8-3641  
Email: [wqin@bu.edu](mailto:wqin@bu.edu)

**GTF :** Chhavi Goenka, PHO 420  
Office Hours: Monday 12-1:30pm, Wednesday 1:30-3pm  
Phone: 3-0159  
Email: [cgoenka@gmail.com](mailto:cgoenka@gmail.com)

## Course Description:

The growing popularity of modern embedded systems calls for a new generation of electrical and computer engineers who can easily cross the boundary between hardware and software. The course is designed to help breed such engineers by introducing students to a balanced view of software and hardware in designing electronic systems. The lectures will survey a broad array of subjects including system specification languages, embedded processors, hardware accelerators, memory architecture, communication architecture, real-time operating systems, hardware-software co-design techniques and verification techniques. The concepts will be reinforced with homework and project assignments that involve system design, modeling and validation. The assignments will involve the Gezel language, ARM/Linux-based evaluation boards, and optionally Xilinx FPGA.

## Prerequisites:

EC312, Computer Organization or equivalent  
Experience in C/C++ programming and Linux

## References:

Jonathan Cobert, Linux Device Drivers, Third Edition, O'Reilly, 2005  
Frank Vahid, Tony Givargis, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley & sons, Inc. 2002

## Grading:

Midterm Exam: 20%  
Homework Assignments: 20%  
Lab Assignments: 20%  
Project: 30%  
Participation: 10%

| Class | Date   | Topic  | HW (due a week after assignment) |
|-------|--------|--|----------------------------------|
| 1     | 15-Jan | Introduction and Overview                    |                                  |
| 2     | 20-Jan | The nature of hardware and software          | HW 1                             |
| 3     | 22-Jan | General purpose embedded cores               |                                  |
| 4     | 27-Jan | The ARM architecture                         |                                  |
| 5     | 29-Jan | Lab 1, PHO 307                               |                                  |
| 6     | 3-Feb  | RTOS I: Introduction, scheduling algorithms  |                                  |
| 7     | 5-Feb  | RTOS II: IPC, synchronization, device driver | HW 2                             |
| 8     | 10-Feb | Lab 2, PHO 307                               |                                  |
| 9     | 12-Feb | Dataflow Modeling                            | HW 3                             |
| 10    | 19-Feb | Dataflow Implementation in HW & SW           |                                  |
| 11    | 24-Feb | Lab 3, PHO 307                               | HW 4                             |
| 12    | 26-Feb | FSMD   |                                  |
| 13    | 3-Mar  | No Class                                     | HW 5                             |
| 14    | 5-Mar  | Lab 4, PHO 117                               |                                  |
| 15    | 17-Mar | Memory mapped interfaces                     | HW 6                             |
| 16    | 19-Mar | Coprocessor interfaces                       |                                  |
| 17    | 24-Mar | Lab 5, PHO 117                               | Project Kickoff                  |
| 18    | 26-Mar | On-chip Busses                               | HW 7                             |
| 19    | 31-Mar | Metrics of performance and cost              |                                  |
| 20    | 2-Apr  | Project Proposal Presentation                |                                  |
| 21    | 7-Apr  | ASIPs  |                                  |
| 22    | 9-Apr  | ASIPs II                                     |                                  |
| 23    | 14-Apr | Midterm Exam                                 |                                  |
| 24    | 16-Apr | Memory technologies                          |                                  |
| 25    | 21-Apr | Software optimization                        |                                  |
| 26    | 28-Apr | Project Demonstration/Presentation           |                                  |
| 27    | 30-Apr | Project Demonstration/Presentation           |                                  |