ECE 751: Embedded Computing Systems
Prof. Mikko Lipasti

Lecture notes adapted from Prof. Mike Schulte

Course Overview
Class Details

Class Times: 2:30 PM to 3:45 PM on T, R in 2305 ENGR HALL
Instructor: Prof. Mikko Lipasti, 3621 ENGR HALL, 265-2639 mikko@engr.wisc.edu
Office Hours: TBD or by appointment

Website:
http://ece751.ece.wisc.edu

Credits: 3 Section: 1
Prerequisites: ECE/CS 552 (Introduction to Computer Architecture)

Please complete course survey (should have received email):
https://docs.google.com/forms/d/17boCwK_C8oK6tU6fHngtAdurEintrxYh85oW0mGFHtE/viewform?usp=send_form
Goals

• The course goals to provide students with:
  – The skills and knowledge needed to better understand embedded computing systems and to initiate original research in this domain
  – Gain experience in designing and evaluating embedded processor architectures and microarchitectures.
  – An understanding of compiler and run-time software for embedded systems.
  – An opportunity to research embedded computing systems through a class project and presentation.
Course Description

• Examines recent research in high-performance embedded computing systems
  – *Emphasis on embedded processor architectures and microarchitectures*
  – Also covers embedded system design and simulation, embedded compilers and tool chains, run-time systems, and application design

• Places a large emphasis on
  – Reading and discussing research papers and textbook material
  – Working through real/practical examples

• Course project used to help you put the ideas from the course into practice
Course Textbook and Tools

• There is no required textbook for the course
  – We will rely on readings from the literature

• Useful reference texts include
Course Research Papers

• About 30 research papers will be assigned
  – Typically two per week
  – Available from the course website
  – Read before coming to class & be ready to discuss

• Subset of papers must be reviewed in writing
  – Typically one per week
  – Review due dates will be posted on course website:
    typically the night before scheduled class discussion
  – Reviews must be uploaded to learn@uw dropbox
Research Paper Presentations

• Each student will be asked to lead discussion on a research paper
• Prepare 15-minute talk w/slides
  – Thoroughly understand, describe paper
  – Read 6-10 additional papers for full context
    • For newer papers, primarily citations from the paper
    • For older papers, also include newer papers that cite this one (find using Google scholar, ACM digital library, IEEE Explorer)
• Excellent practice for ECE PhD Qualifier
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<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Paper reviews and discussion</td>
<td>25%</td>
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<tr>
<td>Paper presentations</td>
<td>15%</td>
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<tr>
<td>Final exam</td>
<td>20%</td>
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<tr>
<td>Course Project</td>
<td>40%</td>
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Course Outline

• Introduction
  – Course introduction
  – Embedded system design goals
  – Categories of embedded processing
• Review of CPU concepts (please fill out survey)
• Microarchitectures for high-performance/low-power embedded computing
• Embedded software
• Memory architecture for high performance embedded computing
• Embedded Multiprocessors
• Accelerators and peripheral processors
• Design and Modeling tools and methodologies
Project [1]

• For the course project, you will be expected to complete original work related to embedded systems in teams of three or four students.
• Projects will consist of a proposal, status report, final report, and short presentation.
• You are encouraged to come up with your own topic for the project, but will be provided with a list of possible ideas.
• Projects can consist of an in-depth survey, original research, and/or hardware or software development related to embedded systems.
Project [2]

• The class project counts for 40% of the overall grade.
• Students will be expected to turn in a summary of the contribution to the project to facilitate fair grading to individual team members.
• Additional details on the course projects will be provided in a separate document.
Other Items

• **Plagiarism:** using someone else’s ideas, words, figures without proper acknowledgement
  – Is illegal and not allowed in this class
  – Be sure to phrase statements in your own words and cite appropriate references directly in the text
  – Failure to do so will result in severe grading penalties

• **Communication:**
  – Questions and comments during class are encouraged
  – I encourage you to meet with me during office hours
  – I will frequently email the class
  – When sending email include **ECE751** in subject
Next Steps

• Visit course website ece751.ece.wisc.edu
• Read over first two papers (no reviews)
• Course website has a lot of material with copyrights – do not post or distribute