Method of Evaluation for Students in Embedded System Design and Synthesis

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Well-design evaluation metrics for student performance should reflect how well they have reached these course goals, and encourage students to reach them.

1. Prepare students for research in embedded system synthesis and design.
2. Achieve a broad understanding of the challenges and research problems related to embedded systems.
3. Complete original projects that may serve as foundations for further research.

I will be mixing the motivations for the evaluation metrics with their descriptions, because understanding the goal for each metric will help you appropriately allocate your time. The following metrics will be used.

1. Projects 50%: Projects are assigned to give you the opportunity to work deeply on a particular embedded system design or synthesis problem, and perhaps have a head start on a research paper appropriate for publication in a technical journal or conference. I will consider the importance, scope, difficulty of the selected problem as well as the quality of the solutions. Reports and demonstrations also influence this score. Most of the weight will be put on the final project. However, the proposals and reports throughout the semester should be taken very seriously; if they are not of good quality, it is less likely that the final project will be of good quality. Within this category, final projects are given twice the weight of mini-projects.
2. Presentations 25%: Presentation skills are important. Without the ability to clearly summarize your ideas and discoveries, it will be difficult to seek support for your ideas, or receive a good job offer after graduating. Within this category, final project presentations are given twice the weight of mini-project presentations.
3. Literature summaries 10%: The reading assignments, and many of the lectures, are designed to give you a broad understanding of the embedded systems research field. Ideally, after finishing the class, you will be an expert in the area of your project, but you will also have a high-level understanding of most of the problems encountered by embedded system designers and researchers, and immediately know where to find more detailed information on a problem. I want you to be the person at your company or university that people go to with questions about embedded systems. The primary purpose of putting weight on literature summaries, and spending the time to read and in some cases revise them, is to give you some pressure to keep up with reading so you aren't faced with the impossible task of building a broad understanding of embedded systems research shortly before the exam. They also give me the opportunity to provide feedback when I am concerned that your understanding of an article is incomplete, with plenty of time left to review and revise the summary before the exam. You can use your summaries to help study for the exam.
4. Exams 15%: The final exam is given to determine whether you have a broad understanding of embedded system design and research. In the past, these exams have been somewhat challenging but nearly all students have done well. Those who keep up on lectures and assigned reading should not be surprised or afraid of the exam.

What about the first goal, that of "Prepar[ing] students for research in embedded system synthesis and design"? Evaluation of literature summaries, broad knowledge of the field, and project quality are all related to this goal. However, another characteristic of the course is related to this goal. Although I tried to suggest possible areas for your projects, I avoided giving you cookie-cutter problems with straight-forward solutions. Instead, you were stuck refining your own problem definitions, in addition to solving the problems you defined. It is my hope that the course will help you further improve your ability to formalize and define problems, in addition to solving them once they are well defined. That being said, if things seem to be going off-track at the time of the mini-project presentation and report, I will give feedback and suggestions of adjustments to problem definitions.

High-level advice to get the most out of the course, and get a good grade.

1. Keep up with the reading and make sure you have a high-level understanding of the key ideas in each paper. Hand in short summaries to see whether I think you understood the assigned reading. You don't need to understand every detail in the papers. Depth is important, but you will spend a lot of time going deep into technical details when working on your project.

2. Do well on your projects. They are the core of the course. Pick something with the potential for high impact and technical depth but make a realistic estimate of how far you can get before the end of the semester. Make sure that you are comfortable having your project evaluated on the part you actually have time to complete.

3. Spend an evening or two reviewing your literature summaries, lecture nodes, and assigned reading before the final exam.

To help you review the material you have learned in the course, I have prepared a list of topics and questions.

1. What are embedded systems? How do they differ from general-purpose computers? Why is their design challenging? See lecture notes packet 1.

2. Heterogeneous multiprocessor system-on-chip design problem.

3. Models and specification languages.

4. Introduction to complete and stochastic optimization.

5. Heterogeneous multiprocessor synthesis.

6. System-level reliability optimization.

7. Real-time systems and scheduling.

8. Hardware and software data compression for use in embedded systems.

9. Memory hierarchies in embedded systems.

10. Low-power and power-aware design.

11. Embedded operating systems.

12. Emerging applications: sensor networks and cyberphysical systems (there was more interest in sensor networks, so we spent more time on them this time).

13. Impact of device technology on low-power embedded systems

14. Compilation techniques for embedded systems.

15. Estimating and optimizing user satisfaction in computer system design.

16. Energy supply in embedded systems.

Please also look through the lecture notes and the assigned reading on the course website.