

# CIS 750                      Fall 2017

## Advanced Computer Architecture Research Project

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**Office Hours:** Wednesday 3:00 PM - 6:00 PM, and by appointment, Room: 2174 Engineering Hall

### Important Dates

Project Assigned .....	August 21, 2017
Proposal Due .....	October 27, 2017
Final Report Due .....	December 15, 2017

### Project Description and Guidelines

An integral part of this course is a major research project, which is worth 20% of the term grade (and additional 5% for class presentations relevant to the project). The purpose of this project is to provide students the opportunity to more deeply explore fundamental issues in computer architecture while also gaining practical experience. You are encouraged to discuss your interests and ideas with your instructor and peers during preparation of your proposal.

You are to form a team of one, two, or three students and conduct an experimental research project in an area of computer architecture of your choosing (subject to the instructor approval). In general, this research endeavor will involve defining and refining of the problem, construction and demonstration of a strong knowledge base from the related technical literature (e.g., conference and journal papers), design and development of research objects (e.g., programs, models, etc.), design of experiments, completion of experiments, analysis of results, development and demonstration of insight leading to key conclusions, and directions for future research. Some teams may prefer to study architectural issues and use standard benchmarks while some teams may prefer to focus on algorithms and application(s) that run on a particular computer architecture or architectural simulator. For each project, a suitable computer architecture platform or simulator for experimentation relevant to the research goals of your project must be identified.

For all projects, the culmination of the work will consist of a clear, concise, and compelling technical report suitable for IEEE or ACM conference/journal submission, highlighting the undertaken project, experiments, results, analysis, and key insight, and may be an appendix (either paper or electronic) with a clear representation of the objects built for the project, additional data from experiments, etc. All written materials should be prepared and presented in a structured, polished, and professional manner. The project grade will be determined based on the ratio of the challenge and quality of the work versus the size of the team.

It is understood that the topic of your project may support your personal research interests and/or future thesis or dissertation focus. While such an overlap is acceptable and highly encouraged, any previous or current work used in partial fulfillment of the requirements of any other course (e.g., project from a previous course or proposed in another course this term) must be clearly noted in the proposal and those portions may not be counted for credit towards the requirements of this project.

# Project Deliverables

## 1. Project Proposal

*Due Friday, October 27th, at start of the class, and worth 10% of the total project grade.*

The proposal is the culmination of your formal planning for the topic of your project. Here, you hope to convince reviewers (i.e., your instructor and peers in this case) that the topic is worthwhile and feasible, the goals are realistic, the approach is sound, and the research team is qualified and capable of successfully completing the activity. After the title and team name, the following is a template for the key sections that should be included in the proposal in the following order:

1. Subject and purpose (i.e., “what” and “why”) - *1 to 2 paragraphs*
2. Problem definition - *1 to 2 paragraphs*
3. Need for solution (motivation) to the problem (i.e., why the problem is important) - *1 to 2 paragraphs*
4. Potential benefits that will come from the solution - *1 to 2 paragraphs*
5. Problem background - *at least two pages (single column) or one page (double column) including several figures describing key concepts and issues*
6. Related work in the literature - *several paragraphs*
7. Project scope (i.e., what the project is addressing) - *1 to 2 paragraphs*
8. Methods to be used, such as simulation, real hardware implementation (i.e., “how” the project is to be accomplished) - *1 to 2 paragraphs*
9. Breakdown of tasks on the project with clear indication as to which team members will be involved in each task; clear partitioning and delineation are necessary - *include at least 5 key tasks*
10. Time and work schedule - *Gantt chart comprised of key tasks and timeline for each*
11. Facilities to be used - *1 to 2 paragraphs; be specific about software and hardware and/or architectural simulator you will employ*
12. References - *related work references and other references specific to your project topic*

## 2. Status Reports

*Due every other Monday at start of the class, October 30th to December 11th, 4 in all and worth 5% altogether of total project grade.*

Each status report is a one page summary of the project progress in relation to the proposal Gantt chart in terms of tasks: (i) completed to date; (ii) currently underway; and (iii) soon to start. Discussion on recent obstacles and accomplishments should be highlighted. Finally, an indication of the project status as a whole should be included, selected from these three categories: on schedule, behind schedule, or ahead of schedule. When behind schedule, an estimate of how far should be clearly provided in units of days.

## 3. Final Report

*Due Friday, December 15th, at 5:30 pm, and worth 85% of the total project grade.*

The project final report is the primary means by which the quality of your work will be assessed. The project report should resemble a technical publication in IEEE/ACM/Elsevier/Springer in

format and structure. Students will summarize the work done and important contributions and results obtained from the project in a class presentation.

Success of the project is primarily measured by the breadth and depth of research insight that is gained and exhibited by the team in the final report. The sections in the project report should include (a) introduction and motivation, (b) related research, (c) methodology or approach, (d) experiments, (e) results (and analysis), (f) conclusions, (g) future research work directions, and (h) references.

## Project Evaluation

Students in the same team may or may not be assigned the same grade on the project. Self-evaluation forms will be distributed and confidentially completed by each student and submitted with the final report. With this form, each student will cite and rate their own personal contributions to the project as well as those of each of their team partner(s). The professor will use this input along with other information in determining each student's project grade.

## Project Resources

Students are free to look and choose resources required for their project. The following resources can be helpful for students in accomplishing their project:

- SESC: SuperESCalar Simulator <http://iacoma.cs.uiuc.edu/~paulsack/sescdoc/>
- The gem5 simulator [http://www.m5sim.org/Main\\_Page](http://www.m5sim.org/Main_Page)
- The Sniper Multi-Core Simulator [http://snipersim.org/w/The\\_Sniper\\_Multi-Core\\_Simulator](http://snipersim.org/w/The_Sniper_Multi-Core_Simulator)
- Cavium network simulator <http://www.cavium.com/>
- NVIDIA Tegra GPU <https://developer.nvidia.com/embedded/buy/jetson-tk1-devkit>
- Raspberry Pi <http://www.raspberrypi.org/>