This semester you have two options.

A. **Research**: You will research a topic of current interest and at the end prepare a term Project Report. You will also produce a presentation to be for the benefit of fellow students. If logistics permits, the presentation will take the form of a poster. The objective of this project is for you to explore the state of the art relating to some of the topics in the class.

B. **Development**: Design and implement a new application using an embedded system (Raspberry Pi). You must formulate, design and implement the system yourself. Your report should provide a good documentation. See details here.

**Research**:

The research term paper will be based on a comprehensive study of the particular topic of related to the current state of technology and recent trends. You are required to formulate your own views of the topic once you have understood the concept well. You will also mention how you expect things to evolve in the future.

Some details are subject to revision.

- Form/Join Team: October 9, 2017
- Detailed Abstract: Nov 3, 2017
- Presentation document: Nov. 29, 2017
- Final Paper: December 13, 2017

List of recommended topics: You may choose from the list below. If you like you may choose slightly different topics after consulting with the instructor.

**Multithreading**:

1. Simultaneous multithreading (e.g. Hyperthreading) architectures
2. Simultaneous multithreading programming issues
3. Simultaneous multithreading scheduling and performance
4. Courseware development for thread pools

**Multicore Processors**:

5. Scalability of computational performance with the number of processor cores.
6. Parallel programmability. How to reduce the programming effort for multi-core architectures.
7. Resource management. How to utilize and manage computational resources in multicore systems.
8. Virtualization. How does virtualization advance our ability to utilize multicore systems.
Virtualization:

9. Performance Comparison of Virtualization Desktop Hypervisors: (e.g. VMPlayer, VirtualBox, etc.)
10. Performance Comparison of Virtualization Server Hypervisors: (e.g. KVM, Xen, VMWare ESXi)
11. Storage virtualization (e.g. Instance Store, Elastic Block Storage, others)
12. Security issues in hypervisors
13. Recent developments in Full virtualization hypervisors (e.g. KVM, XEN hvm)
14. Spot Instances/Auction based pricing mechanisms for virtual machines
15. I/O virtualization drivers/methods comparison (e.g. KVM virtio, others)
16. Server consolidation/ Live migration of Virtual Machines
17. Virtualization schedulers comparison (e.g. Xen SEDF, Credit, BVT)

Cloud as a system element:

18. Cloud gaming: architecture and performance
19. Cloud backup: performance and reliability
20. Disaster recovery using virtualization

Embedded/handheld systems:

21. IOS/Android recent OS developments
22. OS support for Power Management in Smartphones
23. Testing embedded system software/hardware

Forming the groups: You can take the lead and try to form a group (by advertising it on Piazza), or join a groups others are trying to form. A group will have 3 or 4 students. There can be a maximum of two groups with an identical topic. You can claim a topic as your own by mentioning it on Piazza with the topic clearly identified in the post title (for example “Topic 26 Power Management in Smartphones”).

Detailed Abstract:

The first deliverable of the term paper is a detailed abstract, around 1000 words. It should include a brief description of the topic and include a minimum of 8-10 total citations of appropriate papers or references.

It must have the following components:

1. Why is this particular topic important now? Why did you choose it?
2. Why will this be important in the future?
3. A history of how this aspect has evolved in the past? The driving forces behind this.
4. A quick snapshot of the current state of the art for this particular aspect.

Items (3) and (4) should cite at least 8-10 references.

Final Report:

The finished term paper should be approximately 4000 words and include a minimum of 10-15 total references supporting the paper. The final term paper must be coherent, succinct, and readable. It should include the following:
1. An introduction that outlines the rationale, organization, and key contributions of the term paper.
2. A literature survey of the topics that contrasts different approaches to the problem.
3. Limitations in the current approaches that may not be suitable in the future, and potential improvements.
4. At least some non-text elements – figures, tables, mathematical analysis, algorithms etc.
5. A conclusion that includes assertions about the state of the art that you have on the topic surveyed. This will also include 4-5 key assertions about what you expect things to look like in the next 2-4 years.

The final report will be in two-column format used by IEEE/ACM. Both the Detailed Abstract and the Final Report (and the related poster) will need to be submitted as pdf files using Canvas.

**Presentation:** The presentation will take the form of a PowerPoint presentation or a poster depending on logistical feasibility. Details will be provided later.

**Grading**

This assignment would be worth 15 points towards your final grade. Following are the points break up.

- 2 points for Term Paper Detailed Abstract
- 2 peer review
- 6 points for Term Paper
- 5 points for the Poster Session, participation