**EE542 : Internet and Cloud Computing**

Instructor: Young Cho, Ph.D. E-mail: younghch@usc.edu

**Course Description**

This course is designed for graduate students in electrical engineering and computer science. Students will learn the theory, architecture, hardware/software, and programming of cloud and fog computing, networks for cloud computing, machine learning and big data analytics , and how they relate to Internet of Things..

Students will begin to gain hands-on experience with containers and OpenStacks within a networked multi-computing emulation testbed like DETERlab and Emulab. Then the students will learn about the architecture of graphic processing units (GPU) and their associated general purpose tools including CUDA and OpenCL. Students will learn to use the existing APIs for repurposing GPUs for use in machine learning. Finally, the students will have an opportunity to get hands-on experience with one of the most popular cloud computing infrastructure, Amazon cloud (AWS).

**Recommended Courses:** EE 457 and EE 450 recommended

**Required Textbook:** None

**Other Requirements:** Experience in C programming

**Grading**

- 15% Class participation and Quizzes
- 10% Reading assignments (based on the scores for the summary presentation slides)
- 30% Laboratory assignments (based on the scores for all of the assignments)
- 10% Final Presentation
- 10% Final Project Check Points
- 30% Final Project Demonstrations

**Preparation for Classes**

- Students will be using Linux based system through the course. It is strongly recommended that the students become familiar with its navigation and use.
- Some of the computer assignments will require the use of C/C++ under Linux environment. It is recommended that students become familiar with the language and typical development environment.
- It is recommended that the students become familiar with some form of hardware description languages.

**Grading Policies**

- Late Policy: No late assignments will be accepted unless the instructor extends the due date. A late assignment results in a zero grade.
- Grade Adjustment: If you dispute any scoring of a problem on an exam or homework set, you have one week from the date that the graded paper is returned to request a change in the grade. After this time, no further alterations will be considered. All requests for a change in grade must be submitted in writing to me.
- Changes/Information: The student is responsible for all assignments, changes of assignments, announcements, lecture notes etc. All such changes should be posted on the course web-site.
- Other: As per university guidelines published in SCampus, the academic integrity policy will be upheld.

**Statement for Students with Disabilities:**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained

from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

**Statement on Academic Integrity**
USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. The Student Guidebook contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:http://www.usc.edu/dept/publications/SCAMPUS/gov/. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

**Syllabus and Weekly Lecture Contents**

| Lectures | Topics Covered, Source, Due Dates and Exams |
|---|---|
| Lectures 1-2, Week 1 | Course Introduction, Principles of Cloud Computing |
| Lectures 3-4, Week 2 | Cloud Architecture, and Service Models |
| Lectures 5, Week 3 | Fog Computing |
| Lectures 6-7, Week 4 | Virtual Machines and Containers |
| Lectures 8-9, Week 5 | Map Reduce and Open Stacks |
| Lectures 10-11, Week 6 | Big Data and Machine Learning Algorithms |
| Lectures 12-13, Week 7 | Deep Learning Tools and Applications |
| Lectures 14-15, Week 8 | Machine Learning on Hardware Accelerators |
| Lectures 16-17, Week 9 | Graphic Processing Units Architecture and GPGPU |
| Lectures 18-19, Week 10 | CUDA and OpenCL |
| Lectures 20-21, Week 11 | Tensor Flow and Applications |
| Lectures 21-23, Week 12 | Industry Standard Cloud Computing Services |
| Lectures 24-25, Week 13 | Cloud Performance and Scaling Techniques |
| Lectures 26-27, Week 14 | Mobile Clouds and Internet of Things |
| Lectures 28, Week 15 | Security on Cloud Computing Facilities |
| Lectures 29-30, Week 16 | Practice Final Project Presentations |
| Lectures 31-32, Week 17 | Final Project Presentations |

**Reading Assignments**
There are weekly reading assignments for which summary slide presentations must be submitted. The presentation should be 3-4 pages including title and summary.

**Laboratory Assignments**
1 DETER Tutorials
2 Virtual Machines and Containers
3 Open Stack Laboratory
4 Map Reduce Laboratory
5 Machine Learning Laboratory
6 CUDA/OpenCL Programming Laboratory
7 Tensor Flow Laboratory
8 Amazon AWS Laboratory

**Final Project**

Final project consists of presentation, report, and demonstrations. And the grades will be based on the scores from all of the components.

**Presentation:** There will be a 10 minute final slide presentation and 5 minute Q&A session for each project group. All students will be required to participate and attend.

**Project Demonstrations:** There will be weekly demonstration of the project progress until the final due date of the project. Weekly milestones defined at the beginning of the project must be demonstrated for a full credit.

**Project Report:** The report should be in the form of a conference paper. This template is provided. The font size of the content of the paper should be between 10-11pts. The report must be DOUBLE COLUMN with minimum of 10 PAGES of content with more than 5 IEEE/ACM papers in the reference. Formatting for the reference must be consistent with IEEE/ACM standard. A potential target conference/workshop should be indicated. The final project report is due on the final examination date.