CS 797A – Modern Computer Architecture and Programming (3) – Spring 2013

Class Room/Hours: 226 Jabara Hall; Tue/Thu from 9:30 to 10:45 AM
Lab Room/Hours: Computer Science Lab (JB 205-206) and CAPPLab (JB 245)

Course Objective: Proper understanding of the building blocks and operations of contemporary computer systems helps design robust networks, write efficient code, and make optimal usages of applications. Computer architecture has been changing to address the growing needs for high performance, low power consumption, and high execution time predictability. The objective of this course is to address some advanced concepts and techniques to design and program modern computing systems. Particular attention will be given to the following areas: multicore architecture, parallel programming using CUDA/GPU, and advanced research.

The pre-requisite for this course is CS 394 (or equivalent). Students who enroll in this class are expected to have experience in C/Linux. By continued enrollment in this class, you are certifying that you have met the pre-requisite.

Instructor: Abu Asaduzzaman (Dr. Zaman)
Office Room: 253 Jabara Hall
Office Hours: Tue/Thu 1:45-3:15 PM
Or, by appointment (via e-mail/phone)
E-mail: Abu.Asaduzzaman@wichita.edu
Phone: 1-316-978-5261 (Office); 1-561-843-2231 (Mobile)

Text-Book(s): (1) Scalable Multi-core Architectures: Design Methodologies and Tools by Dimitrios Soudris and Axel Jantsch; Springer (1st Ed.); 2011.
(2) CUDA by Example: An Introduction to General-Purpose GPU Programming by Jason Sanders and Edwards Kandrot; Addison-Wesley, 2011.

Reference(s): Handouts and Class notes (check WSU Blackboard)

Topics Include:
1) Introduction
   – Computer systems and architecture
   – Parallel Programming (in C)
2) Modern Computing Systems
   – Performance: cache, parallelism, concurrence
   – Cache memory organization: shared, distributed
   – Parallelism: ILP, TLP, HTP4, SMP, PLP
   – Concurrency: multicore, SMT capable multicore with GPU
3) High Performance Computing (HPC) using CUDA/GPGPU
   – Parallel Programming: OpenMP, Open MPI, CUDA/GPGPU
   – History of GPUs leading to their use and design for HPC
   – Introduction to GPU programming model and CUDA for Linux platform
   – Parallel algorithms suitable for CUDA/GPGPU
4) Selected Articles Related to Computer Systems and Architecture
   – Amdahl's Law, Gustafson's Law
   –GPCMP, Tiled CMP, Network Processors
   – Heterogeneous Multi-core Computer Systems
   – Cell Broadband Engine Architecture; Multicore Embedded Systems
Grading Policy (Tentative):
NOTE: Same grading scale for both graduate and undergraduate students.

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<thead>
<tr>
<th>Type</th>
<th>Points</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>HW Assignments</td>
<td>10%</td>
<td>Starting from 2(^{nd}) week</td>
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<td>Quiz</td>
<td>20%</td>
<td>30 minutes, closed book (TBD); ends at 10:00</td>
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<td>Exam 1</td>
<td>20%</td>
<td>Before the Mid-Term point (Mar/12);</td>
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<td>70 minutes, closed book (one 8.5x11 inches cheat-sheet)</td>
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<td>Exam 2</td>
<td>30%</td>
<td>Before the semester ends (May/09);</td>
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<td>70 minutes, closed book (one 8.5x11 inches cheat-sheet)</td>
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<tr>
<td>Project (Proposal +</td>
<td>20%</td>
<td>Proposal – 1+ pages per group; Templates on Bb;</td>
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<td>Presentation + Report)</td>
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<td>Poster/Oral Presentations – PPT slides (or poster);</td>
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<td>Report – 15+ pages per group; Word, one-inch margins, 12-pt times new roman font, single-spaced text</td>
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Project Grading: (Tentative dates)
Proposal (2%) – One proposal per group; due date by March 14\(^{th}\)
Presentation (8%) – In classroom or poster presentation per group
Report (10%) – Hardcopy and softcopy due before May 2\(^{nd}\)

Your final course grade will be approximately based on the following:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points</th>
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<tbody>
<tr>
<td>A</td>
<td>93</td>
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<tr>
<td>A-</td>
<td>90</td>
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<tr>
<td>B+</td>
<td>87</td>
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<tr>
<td>B</td>
<td>83</td>
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<tr>
<td>B-</td>
<td>80</td>
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<tr>
<td>C+</td>
<td>77</td>
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<tr>
<td>C</td>
<td>73</td>
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<tr>
<td>C-</td>
<td>70</td>
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<tr>
<td>D+</td>
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<td>63</td>
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<tr>
<td>D-</td>
<td>60</td>
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<td>F</td>
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Total 93 out of 100 does not guaranty an ‘A’ grade, it depends on overall class performance.

Important Notes:
1. No e-mail submission. (Repeat) No e-mail submission.
   –Everyone must turn in his/her own assignment, unless special permission is given.
2. No late submission for assignments after a week from the actual due date/time.
   –Up to 70% points should be subtracted for any late submission.
3. No make-up exam.
   –Only exceptions: in case of an emergency and/or with prior consent.
   =If the reason for missing a test is illness, a doctor’s note will be consent.
4. NO late submission for project report.
   –One project report should be submitted by each group.
5. Professionalism (e.g., proper manners) is highly expected.
6. All academic dishonesty cases will be handled following the University Code of Academic Conduct. You may check the University Catalog for further information.

GTA Information:
Name: Chok Meng Yip
E-mail: cvyip1@wichita.edu
Room/Hours: CAPPLab JB 245 Tue/Thu 2:00-3:00 PM
NOTE: GTA will grade (and answer your questions regarding) assignments and quizzes.

Definition and Assignment of Credit Hours:
Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.