CS 794 – Multicore Architectures Programming (3) – Fall 2014 (v3)

Class Room/Hours: TBD
Lab Room/Hours: CAPPLab (JB 245) via Computer Science Lab (JB 205-206)

Course Objective: Proper understanding of the building blocks and operations of contemporary multicore/manycore architecture is a must to design modern computer systems, write efficient code, and develop robust networks, etc. Computer architecture has been changing to address the growing needs for high performance and low power consumption. The objective of this course is to address multicore/manycore concepts and concurrent/parallel programming techniques to design and program current/future computing systems. Special attention will be given to GPU assisted CUDA/C programming and advanced-level research in the related topics.

The pre-requisites for this course are CS 211 and CS 394 (or equivalent). Students who enroll in this class are expected to have experience in Linux operating systems and C/C++ programming languages. By continued enrollment in this class, you are certifying that you have met the pre-requisites.

Instructor: Abu Asaduzzaman (Dr. Zaman)
Office Room: 253 Jabara Hall
Office Hours: TBD
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) Handouts: Multicore/Manycore Systems and Multithreaded Parallel Programming by Dr. Zaman (via WSU Blackboard)
(2) CUDA by Example: An Introduction to General-Purpose GPU Programming by Jason Sanders and Edwards Kandrot; Addison-Wesley, 2011.
Reference(s): Structured Computer Organization (6th Ed) by Andrew S. Tanenbaum

Topics Include:
1) Introduction and Motivation (1 week)
   – Computer Architecture
   – Parallel Programming (in C/C++)
2) Modern Computing Architecture (for higher performance) (5 weeks)
   – Parallelism: ILP, TLP, HTP4, SMP, PLP
   – Concurrency: multicore, SMT capable multicore with GPU
   – Amdahl's Law and Gustafson's Law
3) Programming Multicore Architectures (7 weeks)
   – Parallel Programming: OpenMP, Open MPI, CUDA in C/C++
   – OpenMP, Open MPI
   – CPU/GPU Technology
   – History of GPUs leading to their use and design for HPC
   – Introduction to CUDA programming model
   – Parallel algorithms suitable for CUDA/GPU
4) Selected Topics (2 weeks)
   – Modeling and Simulation
   – Diminishing Return, Koomey’s Law
Grading Policy (Tentative):
NOTE: Same grading scale for both graduate and undergraduate students.

<table>
<thead>
<tr>
<th>Type</th>
<th>Points</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW (10+)</td>
<td>10%</td>
<td>The first HW is due in the second week</td>
</tr>
<tr>
<td>Quiz (4+)</td>
<td>16%</td>
<td>30 minutes, closed book (dates TBD)</td>
</tr>
<tr>
<td>Exam 1</td>
<td>24%</td>
<td>Before the Mid-Term point (date TBD); 70 minutes, closed book (one 8.5x11 inches cheat-sheet)</td>
</tr>
<tr>
<td>Exam 2</td>
<td>25%</td>
<td>Before the semester ends (date TBD); 70 minutes, closed book (one 8.5x11 inches cheat-sheet)</td>
</tr>
<tr>
<td>Team-Project (Proposal + Presentation + Report)</td>
<td>25%</td>
<td>Proposal – 1+ pages per group; Templates on Bb; Poster/Oral Presentations – PPT slides (or poster); Report – 15+ pages per group; Word, one-inch margins, 12-pt times new roman font, single-spaced text (more on Bb)</td>
</tr>
</tbody>
</table>

Project Grading:
Proposal (3%) – One proposal per group; due on the Mid-Term Point
Presentation (10%) – Oral/Demo group-presentation, date TBD
Report (12%) – Hardcopy and softcopy due on the reading day

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

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-92</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
</tr>
<tr>
<td>B</td>
<td>83-86</td>
</tr>
<tr>
<td>B-</td>
<td>80-77</td>
</tr>
<tr>
<td>C+</td>
<td>77-73</td>
</tr>
<tr>
<td>C</td>
<td>70-67</td>
</tr>
<tr>
<td>C-</td>
<td>67-63</td>
</tr>
<tr>
<td>D+</td>
<td>63-60</td>
</tr>
<tr>
<td>D</td>
<td>60-0</td>
</tr>
<tr>
<td>F</td>
<td>0-0</td>
</tr>
</tbody>
</table>

Total 93 out of 100 does not guaranty an ‘A’ grade; it depends on overall class performance.

Important Notes:
1. No e-mail submission for HW. (Repeat) No e-mail submission for HW assignments.
   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: TBD
   E-mail: tbd@wichita.edu
   Room/Hours: CAPPLab JB245 / (?)
   NOTE: GTA will grade (and answer your questions regarding) HW 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.