

**OAKLAND UNIVERSITY, School of Engineering and Computer Science**  
**Concurrent and Multicore Programming, Winter 2015**  
**CSE-536-14858 / CIT-436-14857 / CSE-436-14856**

**Last update on December 10<sup>th</sup> and Jan 6<sup>th</sup>, 2014 (added requirements and materials info); update may still be possible until the class starts**

**Lecturer:** Yonghong Yan ([www.secs.oakland.edu/~yan](http://www.secs.oakland.edu/~yan)), [yan@oakland.edu](mailto:yan@oakland.edu)

**Office:** 534 Engineering Center; **Tel:** (248) 370 4087

**Office Hours:** Thursday at 12:30 – 1:30PM or by appointment

**Class Time:** 3:30 pm - 5:17 pm Monday Wednesday; Jan 06, 2015 - Apr 28, 2015; first class: Jan 7th (Check <http://www.oakland.edu/important-dates> for other important date/deadline for Winter 2015 semester)

**Building and Room:** Dodge Hall of Engineering (DHE) 167

**Course Catalog Description:**

This course will focus on concepts, theory, design and implementation of concurrent programs for multi-core computers, multi-core programming methodologies. Topics covered include mutual exclusion, memory model and thread-based parallelism, fork-join framework, locks, parallel control flow, concurrent data structures.

4.000 Credit hours

4.000 Lecture hours

**Levels:** Graduate, Post Bachelor, Graduate Professional Development, Doctoral & Ed Specialist, Undergraduate

**Schedule Types:** Main Campus Classroom, Lecture

Computer Science & Engineering Division Computer Science & Engineering Department

**Requirements:**

Minimum requirements include good skills of C programming, e.g. the use of macro, pointer, array, struct, union, function pointer, and library for memory allocation and de-allocation (malloc and free); knowledge of computer architecture (memory hierarchy, cache, virtual address), and good reasoning and analytical ability. Knowledge or courses already taken for data structures, programming languages and compilers, and operating systems will also help. Familiarity with Linux environment will be important for the assignments.

**Course Objectives:**

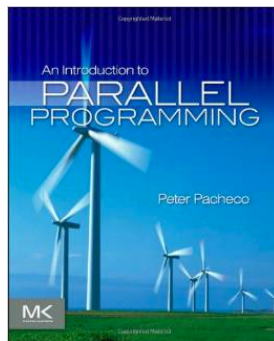
Upon completion of course, successful students shall be able to

1. Describe benefits of concurrent and parallel programming for multicore computer architectures;
2. Explain key concepts in multicore and manycore computer architectures, e.g. memory model, NUMA and cache coherence.
3. Understand principles for concurrent program design, e.g. mutual exclusion, critical sections, locks.
4. Write and reason parallel program using pthreads, OpenMP and CUDA (all C based)
5. Perform analysis of parallel application performance and tuning for improving performance.
6. Discuss applications of concurrent programming.

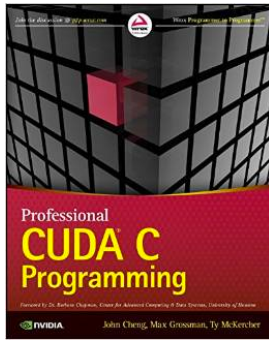
**Textbook and materials:**

Most of the materials can be found from Internet and I will provide a list of links for those resources. There is no **required** textbook. The two recommended textbooks are:

**Recommended Textbook:**



An Introduction to Parallel Programming, By Peter Pacheco, Morgan Kaufmann Publishers Inc  
<http://www.cs.usfca.edu/~peter/ipp/>



Professional CUDA C Programming, John Cheng, Max Grossman, Ty McKercher, <http://www.wiley.com/WileyCDA/WileyTitle/productCd-1118739329.html>

### Grade Assessment:

Course grade will be a combination of homework and projects, class participation, midterm and final exams. Attendance is required for this class.

<b>Homework and Projects</b>	<b>~40%</b>
<b>Class participations</b>	<b>~10%</b>
<b>Midterm (Wednesday March 4th during the class)</b>	<b>~20%</b>
<b>Final Exam (Monday April 27 3:30-6:30 PM)</b>	<b>~30%</b>

### Behavioral Contract: (For lectures and homework/project)

- This class is offered in classroom with PCs and will include both lecture and lab practices; please read the following carefully, students will be asked to leave the labs if they do not follow this contract:
  - Digital devices such as: cell phones, tablets, ipod, mp3 players... etc need to be placed out of sight and must be set to silent. (I will keep my cell phone avail, for emergency preparedness)
  - No headphones are allowed.
  - Students are expected to use the PCs only for this class's material and applications.
  - Surfing the net for Social sites and being on Social Media are not allowed **during lecture hours**. Anyone who is not following this rule will be asked to leave the laboratory/lecture.

### Attendance

- Attendance is required in all of the classes; it is part of a student's grade not an extra credit.
- Attendance is taken at the **beginning of class**. If you come in late (10 minutes after lecture starts), you will be logged in as **Late Arrival, 2 Late Arrival = 1 Absence** or if you choose to leave early (more than 10 minutes before the lecture ends), you will be logged as **Left Early. 2 Left Early = 1 Absence.**
- **If you miss more than 2 classes you will not receive any credit for attendance. (The 2 classes include excused absences.)**
- Class participation is part of your grade make sure to participate in our class practices.

### Homework and Projects:

Most of the homework and projects will be given as lab assignments that you can do it either in the lab or from home computer. Unless it is announced as teamwork, all assignments and class activities will be completed **individually**.

**Late Policy:** (PLEASE READ CAREFULLY)

**Each assignment has a due date. The grade of any late work will be subjected to the following penalty: Each late day will cause 25% grade deduction, if the assignment is late more than 4 days then the grade is 0.**

### Moodle:

A session specific website is located at <https://moodle.oakland.edu/moodle>. This website will include all the course materials (notes, schedules, assignments, etc) for our course. Assignment will be available for

download from this site, and they should be submitted using Moodle only. Please check this site often for updates.

**Mid Semester Evaluations:**

A mid semester evaluation will be conducted for all students registered in this course. For those students who are not achieving satisfactory progress (2.0) in this course at that point, an unsatisfactory grade (U) will be entered on SAIL.

**Academic Conduct:** *Expected conduct on assignments and exams*

Although students may discuss an assignment, each student should complete his or her assignment individually. Copying of another's assignment is not permitted. It is assumed that ALL work throughout the term is your own. Discussions during an exam or quiz are not permitted. Cheating during an exam or quiz is not permitted. It is assumed that ALL WORK THROUGHOUT THE TERM IS YOUR OWN! **Discussion of lab assignments are permitted but copying of assignments is not! Handing in a lab assignment or exam that was essentially copied from someone else does constitute as cheating.** All of the tests are closed book unless it was told otherwise. Obtaining help from notes, another individual or from hand held computing devices during an exam is regarded as cheating. The Oakland University Academic Conduct Policy can be found at <http://www4.oakland.edu/?id=1610&sid=75>. Cheating on examinations, plagiarism, falsifying reports/records, and unauthorized collaboration, access, or modifying of computer programs are considered serious breaches of academic conduct. The Oakland University policy on academic conduct will be strictly followed with no exceptions. See catalog under Academic Policies and Procedures.