FALL 2018

ECE 7650-T01 – Parallel Processing

COURSE DESCRIPTION:

This course is the graduate version of the undergraduate ECE 4530 – Parallel Processing. Material and layout of the course will be the same as the undergraduate course. Graduate students seeking graduate credit will be required to complete an additional project of their choosing subject to instructor approval.

COURSE OBJECTIVE:

The objectives of this course are to introduce students to High-Performance Computing (HPC) and to give students the ability to understand, analyze, design and implement parallel software solutions. Students will develop skills in writing message-passing parallel codes capable of solving large-scale computational problems. Core concepts such as parallel efficiency and load balancing will be covered. The course features detailed analysis of effective techniques for parallel processing of inherently parallel problems and provides a foundation for critically analyzing current and future HPC solutions. Additionally, General Purpose Graphics Processing Units (GPGPUs) will be introduced as parallel co-processors.

PRE-REQUISITES:

Course content is delivered using C/C++ programming languages. While it is not necessary to have previously programmed in these languages you will be required to pick up these languages in order to understand code discussed in class. A background in object-oriented programming will be beneficial. The course material and assignments heavily emphasize programming skills. If you have questions or concerns about your programming background please see the instructor prior to registration.

CONTACT HOURS:

3-hours per week + labs

COURSE CONTENT:

The following topics will be covered. Emphasis and additional topics will be selected based on class interests.

- Basic parallel computer architectures
- Distributed parallel computing using the Message-Passing Interface (MPI)
- Evaluating parallel programs
- Partitioning strategies
- Pipelined computations
- Load balancing
- Algorithms and applications
- An introduction to shared memory parallelism using OpenMP
- An introduction to GPGPUs including OpenCL and CUDA

HOMEWORK/LABORATORIES/PROJECT:

Like the undergraduate course this grad course will have 5 labs and 2 homework assignments. Labs and homework assignments will require time outside of the lab and/or class. For graduate students an additional project, to be determined by the student and approved by the instructor, will be required.

TEXTBOOK:

1. [Not Required] *Parallel Programming*, B. Wilkinson and M. Allen, 2nd Edition, Prentice Hall, 2005.

EVALUATION:

Your final course grade is determined by your performance on the labs/assignments/project and exams:

COMPONENT	NO	VALUE %	TOTAL VALUE	DETAILS / ADDITIONAL INFO
Labs	5	4%	20	
Assignments	2	5%	10	
Project	1	15%	15	Student selected with instructor approval.
Midterm Exam	1	15%	15	
Final Examination	1	40%	40	
TOTAL			100	

GRADE SCALING

Letter	Mark
A+	95-100
A	85-94
B+	80-84
B	70-79
C+	65-69
C	55-64
D	45-54
F	<45

Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure consistency of grading from year-to-year

INSTRUCTOR INFO:

Name: .....Ian Jeffrey
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Office Hours: .....Tuesdays and Thursdays, 11:00am-12:00pm, or by appointment. Please include “ECE 7650” in the subject of any email correspondence.

TEACHING ASSISTANT:

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VOLUNTARY WITHDRAW:

Monday, 19 November 2018

REQUIREMENTS/REGULATIONS

Student Responsibilities: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and his/her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with, among others, incomplete term work, deferred examinations, attendance and withdrawal, etc..

Lectures: Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- examinations
- assignments
- laboratory reports
- term exams

A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

Please refer any questions regarding Academic Integrity to your course instructor.

***Plagiarism:** to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source